Keeping Dry Streams Green: Can Landowners in Arizona and California Use Property Rights to Maintain Groundwater-Dependent Riparian Habitat along Non-Perennial Watercourses?

Christopher J. Losi, University of Arizona

Available at: https://works.bepress.com/christopher_losi/1/
Keeping Dry Streams Green: Can Landowners in Arizona and California Use Property Rights to Maintain Groundwater-Dependent Riparian Habitat along Non-Perennial Watercourses?

Christopher J. Losi

Abstract

In the southwestern United States, riparian areas—the ribbons of green vegetation found along watercourses—offer the most valuable habitat within the desert ecosystem. The most valuable of these riparian areas are dominated by trees whose roots draw water directly from a shallow aquifer. Shallow aquifers are found along perennial streams—streams that flow year-round—but shallow aquifers are also found along streambeds that are generally dry. From a biological standpoint, the lack of surface water flowing down a watercourse may not harm the riparian vegetation. From a legal standpoint, the lack of surface water is significant. In Arizona and California, two states where a majority of streams are non-perennial, surface water use is tightly controlled under the legal doctrine of prior appropriation while groundwater use is largely unregulated. Due to the general absence of property rights for groundwater, public and private landowners interested in conservation lack established legal tools to protect these shallow aquifers from increased water use upstream.

This article explores legal doctrines that public and private landowners might utilize in order to obtain a legal right to a stable depth to groundwater for the use of riparian vegetation. After dismissing the standard legal doctrines pertaining to groundwater, this article considers the California doctrine of “subterranean streams,” the Arizona doctrine of “subflow,” and the doctrine of federally reserved water rights. The article concludes that in some cases these latter doctrines might provide the protection a landowner needs to halt consumption elsewhere. However, these doctrines would not apply in all situations and, as the landowner would be interpreting these doctrines in a novel manner, she would likely face an uphill battle in the courts. The article ends with a few suggestions for legislative changes that would not substantially alter the existing system of water rights but would greatly increase opportunities for the protection of this important resource.

---

A1 J.D., University of Arizona James E. Rogers College of Law, May 2011; Master of Forestry, Yale School of Forestry and Environmental Studies, February 2001; BA, Ecology & Evolutionary Biology, Princeton University, June 1996. The author would like to thank Julia Fonseca from Pima County, the scientists and managers at the Nature Conservancy, and Professor Robert Glennon for their help in preparing this paper.
Table of Contents

I. Introduction ........................................................................................................................... 2

II. Sub-irrigated riparian habitat: an ecological community in need of protection .... 4

III. Protection of sub-irrigated riparian habitat under state law ................................. 8
    a. Appropriation of in-stream flows .................................................................................. 8
    b. Direct appropriation of groundwater ........................................................................... 11
       i. Unappropriable groundwater .................................................................................... 11
       ii. Appropriable groundwater ........................................................................................ 12
          1. Subterranean Streams ............................................................................................... 13
          2. Subflow ...................................................................................................................... 15
       iii. Establishing a beneficial use for riparian vegetation ............................................. 20
       iv. Appropriating a level of water rather than a quantity ............................................ 22
       v. Can a landowner protect sub-irrigated riparian habitat using state law? ............ 26

IV. Protection of sub-irrigated riparian habitat under the federal reserved rights doctrine ........................................................................................................................................ 28
    a. Protecting a purpose, not simply a quantity ................................................................. 28
    b. Defining “Purpose” ......................................................................................................... 30
    c. A brief analysis of some federal reservations ............................................................... 32
    d. Suggestions for federal land managers ......................................................................... 34

V. Suggestions for legislative changes .................................................................................... 35

VI. Conclusion ....................................................................................................................... 37

I. Introduction

In the southwestern United States, trees and other vegetation that grow along watercourses are an essential component of desert ecosystems. This riparian habitat provides economic as well as ecological benefits, yet its continued survival is at risk in the face of increased groundwater extraction and consumption.

In the Southwest, the highest value riparian habitat draws water directly from a shallow water table; this groundwater-dependent habitat will die or degrade if the water table drops. If groundwater-dependent riparian habitat is located next to a perennial watercourse (a river or stream that flows year-round), protecting the continued flow of surface water will, indirectly, maintain a shallow water-table and, as a result, will protect the associated riparian habitat.¹

¹ This statement assumes that the stream and groundwater are hydraulically connected. See infra, footnote 37.
However, a great deal of riparian habitat in the southwest is found along watercourses that only flow seasonally (intermittent streams) or in response to a rain event (ephemeral streams). Due to the complexities of western water law, protecting this latter habitat requires a different set of legal strategies than those used to protecting surface water. As it turns out, it is much more difficult to protect groundwater-dependent habitat along non-perennial streams (hereafter “sub-irrigated riparian habitat”) than to protect similar habitat along perennial streams. The distinction is particularly acute in Arizona and California, two states which lack comprehensive groundwater regulation but support a majority of non-perennial streams.

This article explains why it is so difficult for public and private landowners to protect sub-irrigated riparian habitat, and what can be done to fix this problem. Section II of this article describes the economic and ecological importance of sub-irrigated riparian habitat and the threats

---

2 An ephemeral stream is one which “flows briefly in direct response to precipitation in the immediate vicinity…” while an intermittent stream is one where “portions flow continuously only at certain times of the year, for example when it receives water from a spring, ground-water source or from a surface such as melting snow (i.e. seasonal).” Lainie R. Levick et al, The Ecological and Hydrological Significance of Ephemeral and Intermittent Streams in the Arid and Semi-arid American Southwest, 6, U.S. Environmental Protection Agency and USDA/ARS Southwest Watershed Research Center, EPA/600/R-08/134, ARS/233046, 2008, 116 pp. A spatially intermittent stream describes a watercourse which is not perennial along its entire length but is separated in space by ephemeral or intermittent reaches. Id. This article considers streams as a collection of stream segments-- thus a spatially intermittent stream will be analyzed as a collection of perennial, intermittent, and perhaps ephemeral segments. In non-technical terms, this is vegetation that draws most of its water directly from the aquifer but grows along streams that only flow for part of the year.

4 The term “sub-irrigated” was used to describe crops planted in California’s arid Owens Valley that were able to thrive because they could draw water from a shallow water table. To be precise, all groundwater dependent riparian habitat is sub-irrigated; it does not matter whether the stream is perennial, intermittent, or ephemeral. For the purposes of this article, however, the term “sub-irrigated riparian habitat” is being used to refer specifically to that subset of groundwater dependent riparian habitat that is found along non-perennial streams, since this habitat has a greater intuitive connection to subsurface water.

5 See Section III, infra.

6 In Arizona, 94% of streams are intermittent and ephemeral while in California (which includes a very wet northern coastal portion), 66% of the streams are intermittent and ephemeral. Levick supra note 2 at 5. The national average is 59%. Id.

7 This article does not explore regulatory solutions for the protection of sub-irrigated riparian habitat. It is certainly possible for valuable habitat to be protected by laws (such as the Endangered Species Act) which seek to control the use and development of private property. However, such regulatory solutions, while often effective for a time, depend on sustained political support to avoid repeal or reversal. Instead, this article explores ways in which sub-irrigated riparian habitat can be protected by acquiring or purchasing property rights to the water on which the habitat depends. Such a protection strategy generally enjoys wide political support, has less of an effect on pre-existing rights, and is likely to offer more secure protection to the habitat in the long run.
to its continued existence. Section III discusses state water law in Arizona and California and explains how it would be very difficult under state law to appropriate the water on which sub-irrigated riparian habitat depends. Section IV discusses federal reserved water rights and demonstrates that riparian habitat can often be more easily protected under the federal doctrine than state law. Section V suggests some legislative changes that would make it easier for a landowner to obtain such a water right. Section VI presents a brief conclusion-- that if we wish to maintain the ecological integrity of desert ecosystems, courts and legislatures must begin to recognize property rights to the groundwater on which sub-irrigated riparian habitat depends.

II. Sub-irrigated riparian habitat: an ecological community in need of protection

Riparian Habitat is an essential but at-risk component of desert ecosystems. Although it occupies very small portions of the landscape in arid and semi-arid regions, riparian habitat typically supports the great majority of biodiversity.\(^8\) For example, in the desert southwest, about 80 percent of all animals use riparian resources and habitats at some life stage, and more than 50 percent of breeding bird species nest chiefly in riparian habitats.\(^9\) In Arizona, nearly every species of bird has been found to utilize riparian habitat at some point in its life cycle.\(^10\)

Riparian habitat also provides economic benefits to southwestern communities. In Tucson, Arizona, researchers found that property values were affected positively by the quality of nearby riparian areas. Specifically, homeowners preferred densely vegetated washes, washes with more species of vegetation, and washes with trees that depend on shallow groundwater.\(^11\) Researchers concluded that the cost of dedicating water to riparian conservation under the

\(^8\) Id.
\(^9\) Id. at 47
\(^10\) Id. at 58
Sonoran Desert Conservation plan was in fact lower than the just one of the economic benefits--the increased property tax revenues resulting from the anticipated rise in property values.\textsuperscript{12}

In riparian areas, the depth to groundwater exerts a strong influence on the types of species found.\textsuperscript{13} Many species found in riparian areas are phreatophytes--that is, plants that depend on groundwater for part of their water supply.\textsuperscript{14} Cottonwood trees are one of the most desirable species in supporting riparian fauna\textsuperscript{15} and are heavily dependent on a shallow water table. In Arizona, stands of Fremont Cottonwood and Gooding Willow trees occur “where ground water averages less than about three meters deep.”\textsuperscript{16} Other species such as velvet mesquite are not wholly dependent on groundwater; but benefit greatly from a shallow water table. In upland areas with a deep water table, velvet mesquite trees only reach a height of about four meters; where groundwater is at a depth of less than ten meters, these trees can grow up to ten meters tall.\textsuperscript{17}

Researchers have found a possible link between the availability of groundwater and food resources for wildlife: the biomass of insects and spiders appears to be greater in trees that have lower levels of water stress.\textsuperscript{18} As insects and spiders are an important food source for birds, this

\textsuperscript{12} \textit{Id.} at 709
\textsuperscript{13} Levick, \textit{supra} note \textbf{Error! Bookmark not defined.}, at 41.
\textsuperscript{15} Rosalind Bark-Hodgins, The value of Riparian Corridors in Desert Cities
\textsuperscript{16} Juliet C. Stromberg, Restoration of riparian vegetation in the south-western United States: importance of flow regimes and fluvial dynamism, \textit{49 Journal of Arid Environments} 17, 2001, at 22. Even in places where the water table is less than three meters from the surface, these species can die if the water table falls too rapidly. Patrick B. Shafroth, Juliet C. Stromberg, and Duncan T. Patten, Woody Riparian Vegetation Response to Different Alluvial Water Table Regimes, \textit{60 Western North American Naturalist} 1:66, 2000, at 66 (finding that 92% of willow and cottonwood trees died along a stream in northwestern Arizona when the water table dropped 1.1 meters in a year even though the lower water level was only 2.55 meters below the surface)
\textsuperscript{17} Stromberg, \textit{supra} note 16 at 23. \textit{See also} Levick, supra note \textbf{Error! Bookmark not defined.}, at 42 (noting that greater water availability may lead to greater canopy cover. Canopy cover is degree to which the ground is shaded by trees)
\textsuperscript{18} Chris Kirkpatrick, Courtney J. Conway, and Dominic LaRoche, Effects of Ground Water Withdrawal on Avian Abundance and Species Richness in Riparian Areas of National Parks in the Desert Southwest. USGS Arizona Cooperative Fish & Wildlife Research Unit, 2009, at 55.
research suggests that the number of birds a riparian forest can support may depend on the availability of groundwater.

Although riparian habitat along perennial streams is probably the most valuable habitat in desert ecosystems, riparian habitat along intermittent and ephemeral streams is also extremely valuable. In one study, researchers compared riparian areas along ephemeral and intermittent streams to nearby upland areas. Even though the riparian areas were not associated with perennial streams, researchers found more than twice the number of birds in the riparian areas than they found in the upland areas.

Not only is sub-irrigated riparian habitat important ecologically, it constitutes a significant component of the total riparian habitat found in the southwestern United States. In the San Pedro Riparian National Conservation Area (SPRNCA), fully 40% of the cottonwood forest is found along intermittent reaches of the river. In Pima County, only 23% of the cottonwood-willow riparian forest and only 1% of the “mesquite bosque” riparian forest is found along perennial streams. All of the rest of these riparian habitat types are located along intermittent and ephemeral streams. Additionally, the distinction between perennial, intermittent, and ephemeral is somewhat artificial. Desert streams may run continuously for

---

19 See Kirkpatrick, supra note 18 at 50 (establishing that at study sites in southeastern Arizona, the number of species of birds and the total number of birds found in riparian areas was higher when surface water was present)
20 Strictly speaking, this habitat may or may not have been sub-irrigated, as it is possible that some of this habitat did not directly depend on access to shallow groundwater.
21 See Levick, supra note 2, at 76.
22 Kirkpatrick supra note 18 at 24 (also see tables on p. 13 & 38 for description of the study sites). Both the number of bird species and the number of individual birds were more than 100% higher in the riparian areas.
23 SPRNCA is located in southeastern Arizona.
25 Email message from Julia Fonseca to Christopher Losi (Oct. 25, 2010). Ms. Fonseca analyzed 2.3 million acres in Pima County. The area excluded wilderness, refuges, national monuments, national parks, military bases, and Indian reservations.
26 Id.
several years and then go dry, making it difficult to classify the stream as perennial or ephemeral.  

Over the past one hundred years 95% of the riparian habitat in the southwest has been destroyed by human activity. Indeed, the “Arizona Partners in Flight Program” has identified low-elevation riparian habitat as the top priority habitat in need of conservation. Given that very little of the original riparian habitat in Southwestern desert areas remains, any comprehensive plan to conserve riparian habitat in the southwest must include strategies to protect sub-irrigated riparian habitat.

Several factors contribute to the loss of riparian areas. These include land conversion, a change in the dominant herbivores, and disruption of hydrologic regimes. While a landowner can easily eliminate the first two threats, there is no easy way to obtain a legal right to maintain a depth to groundwater. In the past, falling groundwater levels along the Carmel River in California, Coal Creek in Colorado, and the Santa Cruz and Gila Rivers in Arizona have led to a loss of groundwater-dependent riparian habitat. Such a trend is unlikely to cease as economic growth seeks new water resources. For example, Kirkpatrick and others noted that one of the intermittent streams that they studied was threatened by a newly permitted well that would deliver 509 acre-feet of groundwater (over 150 million gallons) every year to a planned subdivision. In California, at least 42 of the state’s 450 groundwater basins are already overdrafted, and a recent court decision declined to impose conservation measures in the Mojave

---

27 Levick, supra note Error! Bookmark not defined. at 16.
28 Id. at 66.
29 Partners in Flight is an international cooperative program of agencies organizations and individuals dedicated to conserving neotropical migratory birds.
30 Chris Kirkpatrick, Courtney J. Conway, and Dominic LaRoche, Effects of Ground Water Withdrawal on Avian Abundance and Species Richness in Riparian Areas of National Parks in the Desert Southwest. USGS Arizona Cooperative Fish & Wildlife Research Unit, 2009, 8.
31 Stromberg supra note 16 at 19.
32 Id. at 18.
33 Kirkpatrick supra note 30 at 8.
River basin. Without intervention, these important ribbons of green may all but disappear from southwestern deserts.

III. Protection of sub-irrigated riparian habitat under state law

The law of prior appropriation provides a useful framework for the protection of sub-irrigated riparian habitat. Under prior appropriation, an individual who puts water to a beneficial use “has a right that is superior to later appropriators.” The holder of the appropriative right may therefore enjoin any new or expanded diversions of water that interfere with the prior user’s beneficial use.

Using appropriative rights as a strategy to protect riparian habitat will often involve acquiring new water rights with a late priority date. In cases of drought, appropriators with earlier dates will take their full entitlement and leave very little for the ecosystem. However, this situation is not nearly as problematic as it may seem. Any riparian habitat which is currently present along a desert watercourse has managed to persist with such prior uses. The threat to this habitat is not pre-existing uses but additional water being withdrawn in the future-- withdrawals which can be restricted under the prior appropriation system.

a. Appropriation of in-stream flows

An in-stream flow right is a right to water flowing within a stream. Unlike most appropriative rights, the holder of an in-stream right does not divert the water from its natural course, nor does she use it consumptively. When the holder of an in-stream flow right defends her legal right to a rate of streamflow, she is indirectly maintaining the level of the surrounding

---


36 In some cases, it may be possible to purchase water rights with an early priority date and convert the type of use to one which supports riparian habitat. However, in Arizona, in order for a consumptive use (such as crop irrigation) to be converted to a non-consumptive use (such as wildlife habitat), the water right must be transferred to the state or one of its political subdivisions. See Ariz. Rev. Stat § 45-172(A) (2010).
water table. As long as there is a hydraulic connection between the stream and the groundwater, a drop in the water table will cause a drop in the rate of streamflow.\textsuperscript{37} Since an in-stream flow right gives its owner the ability to enjoin activities that cause the rate of streamflow to decline,\textsuperscript{38} the owner will be able to prevent a decline in the water table, thereby protecting the groundwater-dependent riparian habitat.

In Arizona, a landowner may appropriate in-stream flows by filing an application with the state department of water resources (ADWR). Arizona law recognizes recreation, wildlife, and fish as beneficial uses for which water may be appropriated.\textsuperscript{39} Also, Arizona courts have ruled that surface water does not have to be removed from a stream in order for it to be appropriated.\textsuperscript{40} As a result, both public and private landowners in Arizona may appropriate in-stream flows of water.\textsuperscript{41}

In California, water may not be appropriated unless the appropriator takes “possession of the water, evidenced by some form of diversion or physical control over it.”\textsuperscript{42} While such a rule prohibits new appropriations of water for in-stream flows, a 1991 amendment to the water code allows owners of existing water rights to transfer the rights to non-extractive uses.\textsuperscript{43} The statute

\textsuperscript{37} See Robert Jerome Glennon and Thomas Maddock, III, The Concept of Capture: The Hydrology and Law of Stream-Aquifer Interations, Proceedings of the Forty-Third Annual Rocky Mountain Mineral Law Institute, 1997, at 22-8 & 22-9. A hydraulic connection means that there is a “saturated connection between the stream and the water table.” \textit{Id.} at 22-7. Since groundwater-dependent riparian habitat is found where a shallow water table is located right next to a stream, it is highly likely that the stream and the aquifer are hydraulically connected.

\textsuperscript{38} New surface diversions can definitely be enjoined but it is also possible to enjoin future groundwater pumping. \textit{Cf. In re General Adjudication of All Rights to Use Water in the Gila River System and Source} (Gila River IV), 9 P.3d 1069, 1081-82 (Ariz. 2000) (Wells whose cones of depression reach the ‘subflow’ zone may be included in the general stream adjudication) See section III.b.ii.2, \textit{infra}, for a discussion of subflow.

\textsuperscript{39} Ariz. Rev. Stat. § 45-151(A) (2010).

\textsuperscript{40} Phelps Dodge Corp. v. Ariz. Dept. of Water Res., 118 P.3d 1110 (Ct. App. 2005).

\textsuperscript{41} \textit{Id.}


\textsuperscript{43} Kelly A. Cole, A Market-Based Approach to the Protection of Instream Flow: Allowing a Charitable Contribution Deduction for the Donation of a Conservation Easement in Water Rights, 14 Hastings West-Northwest Journal of Environmental Law, Policy 1153, 1155; But see \textit{California Trout,} 90 Cal. App. 3d at 823 (noting that appropriation can be established by building a water wheel for water power, building a dam, or watering livestock, even though these uses do not involve diversion).
is quite broad and states, “Any person entitled to use water, whether based on an appropriative, riparian, or other right, may petition the board… for a change for purposes of preserving or enhancing wetlands habitat, fish and wildlife resources, or recreation in, or on water.”44 The board may approve the petition “whether or not the proposed use involves a diversion of water.”45 Also, the water protected through this method is in addition to any water that is required to satisfy other ecological requirements under other rules of law.46 In other words, if a state agency requires 3 cubic feet per second (cfs) remain in a stream for fish, an individual with a prior appropriation of 2 cfs may convert the appropriation to a beneficial use of fish and wildlife, thereby guaranteeing a minimum of 5 cfs will be flowing in the stream. Thus, a landowner in California may protect riparian habitat along perennial streams by converting a consumptive water right to an in-stream flow right by halting the consumption and eliminating the diversion. The consumptive right can be obtained through the purchase or transfer of an existing appropriation or by appropriating a new consumptive right to water.

Obtaining an in-stream flow right can be used to protect riparian habitat along perennial streams but it is not sufficient to adequately protect sub-irrigated riparian habitat. Even if a landowner appropriates the surface water of an intermittent or ephemeral stream (during the times of year that it flows),47 there is nothing to appropriate during the times of year when the stream is not flowing. Thus, the owner of an appropriative right to intermittent flows would not be able to stop an upstream well owner from lowering the water table during the times of the year when the stream is not flowing. Alas, those times of the year coincide with dry seasons

45 Cal. Water Code § 1707(b)
46 Cal. Water Code § 1701(c).
47 See English v. Ally Ong Hing, 459 P.2d 498, 503 (Ariz. 1969) (Ruling that stream waters are appropriable as long as they flow periodically)
when water demand is greatest. As a result, protecting sub-irrigated riparian habitat requires a mechanism to appropriate the groundwater itself.

b. Direct appropriation of groundwater

A landowner who wishes to obtain a property right for a depth to groundwater must overcome three barriers. First, the groundwater must be appropriable. Second, the landowner must identify a beneficial use for the groundwater that is recognized under state law. Third, the state must be willing to accept an appropriative right to groundwater that is not based on a quantity of water but rather the position of the water.

i. Unappropriable groundwater

Both California and Arizona presume that groundwater is “percolating” and hence unappropriable. In Arizona, the “doctrine of reasonable use” allows an overlying landowner to take as much water as he desires as long as he takes the water “for the purpose of making reasonable use of the land from which it is taken.” In *Brady v. Abbott Labs*, the Ninth Circuit Court of Appeals rejected a claim by farmers whose pecan orchards died when a neighbor caused the groundwater level to drop sixteen feet. The plaintiff’s trees did not require irrigation due to the presence of a shallow water table. Defendant Abbott Labs extracted the water in order to construct an underground storage structure. The appeals court ruled that the laboratory’s use was reasonable because, even though the water that it extracted was not *applied* to the overlying *land*, “Arizona water law does not require that the withdrawn water be ‘used,’ so long as it is extracted for the reasonable beneficial *use* of the Abbott’s *land*.”

---

49 433 F.3d 679 (9th Cir. 2005).
50 *Id.* at 681.
51 *Id.* Abbott Labs grossly violated the terms of its permit, pumping more than 122 acre-feet of groundwater when it was only authorized to pump 2.07 acre-feet. However, this fact appears not to have influenced the court’s analysis.
52 *Id.* at 683 (emphasis changed).
California groundwater law is not as harsh as Arizona’s. Instead, California recognizes a system of correlative rights where overlying landowners may be expected to reduce their consumption to allow for new beneficial uses. Nevertheless, in most of California, an appropriator of groundwater may not enjoin future appropriators from pumping new groundwater.\footnote{The situation is slightly different in California’s sixteen groundwater basins that have been adjudicated (out of a total of 450 basins). Under adjudication, a court sets the total amount of water which may be pumped from the basin and assigns pumping rights to individuals. Pumpers which exceed allocation are taxed and the funds which are collected are used to import water to replenish the aquifer. See \textit{Hart supra} note 34 at 1213, 1225-26.}

\textbf{ii. Appropriable groundwater}

In both California and Arizona, courts have created legal “fictions” which allow the appropriation of groundwater in certain circumstances.\footnote{Glennon, \textit{supra} note 37 at 22-21.} “Subterranean streams” and “subflow” are arbitrary categories of groundwater— not grounded in scientific concepts\footnote{It is significant that these categories of groundwater have no independent scientific meaning because courts rely on reports by scientists (hydrologists) to determine whether groundwater in a particular location is part of a subterranean stream, subflow, or percolating groundwater.}— that may be appropriated under California and Arizona law, respectively. Both subterranean streams and subflow are associated with watercourses and are therefore often associated with riparian vegetation. As a result, an appropriator of subterranean streams or subflow has a legal right to prevent future extractions of water that interfere with this right. On the other hand, courts have defined these categories of groundwater narrowly and a party asserting that groundwater belongs in one of these categories bears the burden of proof.\footnote{North Gualala Water Co. v. State Water Res. Control Bd., 139 Cal. App. 4th 1577, 1593 (2006).}

The concepts of underground streams and subflow came from a Utah lawyer named Clesson Kinney who wrote about water law in the late 1800s and early 1900s.\footnote{Glennon and Maddock, \textit{supra} note 54 at 22-21.} To understand these concepts, one must first understand how streams interact with the surrounding aquifer.

When a stream and its surrounding aquifer are hydrologically connected, water moves between
the stream and the surrounding aquifer. Streams can be thought of as locations where the water table is above the surface of the earth. “While hydrologists generally reject the popular concept of an “underground river,” the sediment below the channel does convey water.” Since water obeys the law of gravity whether it is in a stream or in an aquifer, the groundwater beneath and surrounding a stream can be expected to move in the same general direction as the surface stream, although at a much slower rate.

1. Subterranean Streams

In 1899, the California Supreme Court upheld a determination that groundwater in the outlet of the San Fernando Valley was part of a “subterranean stream” flowing through a portion of the valley that was 1.5 to 2.5 miles wide. Pomeroy was a condemnation proceeding concerning a 0.25-mile-wide parcel of land along the Los Angeles River that the City had condemned for the purpose of collecting groundwater and transferring it to the City. Although both parties agreed that the prior owner had a right to be compensated for the value of the land, the prior owner claimed that the City should compensate him for the value of “percolating waters” beneath his property. The City argued that it already owned the waters beneath the property as part of its pueblo right. A jury agreed with the city and decided not to award Pomeroy any damages for the loss of the groundwater.

On appeal, the California Supreme Court affirmed, ruling that, even though water may “percolate,” a subterranean stream can exist when “the material through which the water forces

---

58 Levick, supra note Error! Bookmark not defined. at 10.
59 Cite.
60 Cite.
61 City of Los Angeles v. Pomeroy, 57 P. 585, 597-98 (Cal. 1899).
62 Id. at 587.
63 Id. at 591.
64 Id. at 591. Pueblo rights are “the rights of a municipal successor to a Spanish/Mexican pueblo to reasonable and beneficial use of the water underlying the historic pueblo.” Hart, supra note 34, at 1219. In California, Pueblo Rights trump all other claims of use. Id. at 1220.
itself fills a well-defined channel, with impervious sides and bed, through which a considerable body of water flows from its source to its resting place.”

Although no one had physically located the boundaries of the channel in *Pomeroy*, the court was able to infer its existence because the hills bounding the valley likely met underground, the direction of the subsurface flow of the Los Angeles River corresponded to the direction of the surface flow, and the volume of the stream increased as it entered the narrowest portion of the pass.

More than 100 years after *Pomeroy*, a California appeals court, informed with modern scientific knowledge, considered the concept of subterranean streams once again. In *North Gualala*, a water company challenged the state Water Board’s determination that the company’s wells were pumping water from a subterranean stream and were therefore subject to regulation by the state.

The *North Gualala* court determined whether groundwater is part of a subterranean stream using the Board’s four-part test:

1. A subterranean channel must be present.
2. The channel must have a relatively impermeable bed and banks.
3. The course of the channel must be known or must be capable of being determined by reasonable inference.
4. Groundwater must be flowing in the channel.

The court rejected the water company’s narrow definition of subterranean streams. First, underground streams are not limited to water moving through underground tunnels in bedrock but may consist of water slowly seeping through alluvium (the gravel, sand, silt or clay that

---

65 *Id.* at 597.
66 *Id.*
68 The water company argued that it was pumping percolating groundwater which the state water board could not regulate. *Id.* at 1582.
69 *Id.* at 1585.
70 *Id.* at 1604.
commonly makes up the bed and banks of a stream). Second, although an underground stream should flow “in the same general direction as the channel” subterranean streams may have significant deviations in their flow direction if these deviations are adequately explained by the Board. Third, the bed and banks of a subterranean stream need not be completely impermeable. The court found that the State had met its burden by showing that water moved through the bedrock 300 to 1000 times more slowly than it moved through the overlying alluvium.\textsuperscript{71} Fourth, the court ruled that an underground stream can exist even if it is partially maintained by “subsurface inflows emanating from fractures in the underlying bedrock.”\textsuperscript{72} Based on this analysis, the court held that the water being pumped by the water company’s wells were part of a subterranean stream.

Both \textit{Pomeroy} and \textit{North Gualala} suggest that the water in many riparian areas could be classified as “underground streams,” thereby making it appropriable. Where a stream flows through a bedrock-walled canyon, there is a good chance that all of the groundwater in the canyon can be classified as belonging to a subterranean stream.\textsuperscript{73} On the other hand, where a stream flows through a wide valley, there is no underground “channel” and hence no subterranean stream.\textsuperscript{74}

2. \textit{Subflow}

Under Arizona law, groundwater may be appropriable even if it is not bounded by relatively impermeable bedrock. In Arizona, the primary indicator of subflow is the “saturated floodplain Holocene alluvium”-- the sediment which has been deposited in the floodplain during

\textsuperscript{71} Id. at 1583, 1598.
\textsuperscript{72} Id. at 1587, 1599-1600.
\textsuperscript{73} This is because the bedrock-walled canyon will have “relatively impermeable bed and banks” which will enable the “course of the [underground] channel [to be] known.” Id. at 1585 (criteria 2 and 3 of the four-part test).
\textsuperscript{74} See Id. at 1606 n. 16 quoting \textit{quoting Pomeroy}, 57 P. at 596 (“Water moving by force of gravity in a valley or basin of wide extent ... and moving generally through the whole or through a large portion of the basin, along through the natural voids or interstices of the earth, composed of alluvial or other deposit lying throughout the entire basin ... do not constitute a watercourse.”).
the past 10,000 years (the Holocene Period). Water traveling in this alluvium is presumed to be subflow and is therefore appropriable. Unlike subterranean streams in California, the subflow-bearing alluvium is generally surrounded by permeable sand and gravel, allowing water to easily pass in and out of the subflow zone. Since the subflow zone often overlaps with the area of riparian vegetation, an appropriation of subflow could potentially be used to protect sub-irrigated riparian habitat.

Due to the fact that subflow need not be bounded by impermeable bedrock, underground water in Arizona may be appropriated even when it flows through a wide valley. In the San Pedro River watershed, the floodplain Holocene alluvium is up to 5,000 feet wide.

Even though the saturated floodplain Holocene alluvium may be “the most accurate of all of the markers” for delineating the subflow zone, courts have imposed additional limitations on the extent of subflow. Depending on how Arizona courts apply these limitations, subflow in Arizona may turn out to be more limited than subterranean streams in California.

One significant limitation to the extent of subflow is that it can exist along the alluvial plain of a perennial or intermittent stream but not an ephemeral stream. This limitation contrasts with California law in which subterranean streams are not expressly limited to areas surrounding perennial or intermittent streams. First of all, unlike the term “subflow,” the

---

75 In re General Adjudication of all Rights to Use Water in the Gila River System and Source (Gila River IV), 9 P.3d 1069, 1076-77, 1073 (Ariz. 2000). According to the trial court, it should be assumed that the floodplain Holocene alluvium is saturated with water.
76 Id. at 1073.
78 Gila River IV, 9 P.3d at 1077.
80 Gila River IV, 9 P.3d at 1076.
81 Id. (“Those parts of the alluvial plain which [subflow] may be a part of or which it is connected to must be the alluvial plain of a perennial or intermittent stream and not an ephemeral stream” (emphasis in original)).
ordinary meaning of the words “subterranean stream” does not imply an association with water flowing on the surface. Second, the court in *Pomeroy* relied on the following definition of a subterranean stream:

In and near the mountains many streams have a bed which was originally a rocky cañon, but has been filled up with bowlders and coarse gravel. In this debris a large portion or all of the water sinks from sight, to reappear only when some rocky reef crosses the channel and forces the water to the surface. The movement of this water through the porous gravel, owing to the declivity of the stream, is often quite rapid, and a considerable volume may thus pass down the channel hidden from sight.  

By explaining that sometimes “all of the water sinks from sight,” the court’s definition would include groundwater that underlies ephemeral streams. Thus, while Arizona Courts have explicitly rejected the possibility that ephemeral streams can have subflow, California law may recognize subterranean streams flowing below and beside the banks of dry river beds.

Another limitation of subflow is that zone must be at least 200 feet from the area where tributary aquifers enter the stream. This limitation could potentially exclude a very large portion of the saturated floodplain Holocene alluvium from the subflow zone, thereby restricting the area in which groundwater levels could be protected. At this time, the Arizona Department of Water Resources (ADWR) has decided not to conduct an analysis of tributary aquifers when delineating the subflow zone for the San Pedro River Watershed. Nevertheless, the ADWR’s subflow delineation report is currently being challenged by water users who wish to limit the extent of subflow. Until such litigation is complete, it is possible that the subflow zone is much narrower than the area which the ADWR has currently delineated.

---

82 *Pomeroy*, 57 P. at 598 (quoting Section 48 of Kinney on Irrigation).
83 *Gila River IV*, 9 P.3d at 1076.
84 *Id.* at 1077. (“where there are connecting tributary aquifers or floodplain alluvium of ephemeral streams, the boundary of the “subflow” zone must be at least 200 feet inside of that connecting zone”)
85 According to Glennon and Maddock, tributary aquifers describe areas where a surrounding aquifer contributes to the flow of a stream. Rivers and streams either gain water from the surrounding aquifer (gaining streams) or lose
In 2009, the Arizona Department of Water Resources (ADWR) completed a report for the San Pedro River watershed in which the agency delineated the extent of the subflow zone for the San Pedro River. Rather, than excluding all areas where the surrounding aquifer contributed to the river’s flow (gaining steams), the ADWR identified the lateral extent of the saturated floodplain Holocene alluvium and then applied setbacks where it was found near “basin fill” material or “tributary alluvium.” Basin fill material is sediment that has a different origin than saturated floodplain alluvium. Tributary alluvium, as applied by the ADWR, is sediment from ephemeral tributaries that has been deposited over the floodplain of an intermittent or perennial stream. In short, the three factors used by the ADWR to delineate subflow are based on geology, none are based on hydrology.

The United States has objected to the delineation technique used by the ADWR, as has the Nature Conservancy. Both objectors argue that the ADWR’s reliance on surficial geology was inappropriate. Specifically, they note that the ADWR excluded from subflow areas where tributary alluvium was deposited on the surface, even though the tributary alluvium was often underlain by Holocene alluvium. As they point out, the courts sought to define subflow using a water to the surrounding aquifer). If the subflow zone must be at least 200 feet inside the tributary aquifer, this could mean that there is no subflow along gaining streams. Glennon supra note 37, at 22-21 to 22-22.

86 ADWR Report, supra note 79.
87 Id. at 6-1. These setbacks are based on criteria from Gila River IV that “where there are connecting tributary aquifers or floodplain alluvium of ephemeral streams, the boundary of the “subflow” zone must be at least 200 feet inside of that connecting zone…” and “where there is a basin-fill connection between saturated zones of the floodplain Holocene alluvium and a saturated boundary of basin fill, the boundary of the “subflow” zone must be 100 feet inside of the connecting zone…” 9 P.3d at 1077.
88 Telephonic interview with Jean-Marie Haney, Registered Professional Geologist and Groundwater Hydrologist for The Nature Conservancy (Nov. 8, 2010)
89 ADWR Report, supra note 86 at 4-12.
91 Objection to Subflow Zone Determination Report for the San Pedro River Watershed, (filed on behalf of the Nature Conservancy) In re the General Adjudication of All Rights to Use Water in the Gila River System and Source, No. W1-103 (Dec. 21, 2009).
“stable geologic unit”\textsuperscript{92} but the ADWR admits that the tributary alluvium which was used to exclude areas from subflow “may eventually get washed away during a flood.”\textsuperscript{93} The objectors also noted that the process used by the ADWR has resulted in an irregular boundary of the subflow zone and certain sections of the river have no associated subflow whatsoever.

Both objectors to the Subflow Delineation report argue that the ADWR should have considered the hydrology of the river and not simply the geology. Where the tributary alluvium is found interspersed with the Holocene alluvium, the objectors argue that the ADWR should consider the direction of groundwater flow. If the groundwater flows in the same direction as the stream, it should be classified as subflow. Certainly, the direction of groundwater flow is relevant to the determination of subflow. The rule set out by Gila River IV states in part that

\begin{quote}
“where there are connecting tributary aquifers or floodplain alluvium of ephemeral streams, the boundary of the “subflow” zone must be at least 200 feet inside of that connecting zone so that the hydrostatic pressure effect of side recharge of this tributary aquifer is negligible and the \textit{dominant direction of flow is in the stream direction}.\textsuperscript{94}
\end{quote}

At the same time, by not considering hydrology, i.e. the direction of groundwater flow, the ADWR has technically included tributary groundwater within the subflow zone.\textsuperscript{95} Thus, while the United States and the Nature Conservancy are arguing that ADWR’s subflow zone determination was too small, the agency’s determination is much larger than it could have been.

Currently, the courts are evaluating the ADWR report to determine if it was prepared properly. Until this report (or a future iteration thereof) is upheld by the Arizona courts, there is no way to accurately predict whether the groundwater under a particular section of riparian habitat is appropriable.

\textsuperscript{92}Gila River IV, 3 P.3d at 1076.
\textsuperscript{93}ADWR Report, \textit{supra} note 86 at 4-12.
\textsuperscript{94}Tributary groundwater consists of those underground waters that “have not yet reached the channels of the water courses to which they are tributary.” \textit{Gila River IV}, 9 P.3d at 1077.
\textsuperscript{95}\textit{Id.} at 1075.
Subflow and subterranean streams are two classes of groundwater which are subject to the prior appropriation system. Since they are both associated with watercourses, a substantial portion of the sub-irrigated riparian habitat in Arizona and California likely depends on these categories of groundwater. On the other hand, many watercourses in California do not have associated subterranean streams and much of the riparian habitat in Arizona may ultimately fall outside of the subflow zone. At this point in time, most of the lines still remain to be drawn. For a landowner who wishes to appropriate groundwater for riparian purposes, this uncertainty is problematic.

iii. Establishing a beneficial use for riparian vegetation

Another major source of uncertainty for the conservation of sub-irrigated riparian habitat is whether courts in Arizona and California will recognize the maintenance of riparian vegetation as a beneficial use of water. Even where sub-irrigated riparian habitat depends on appropriable groundwater, no one may appropriate water unless he can articulate a beneficial use for the water. In Arizona, a person may appropriate surface water (including subflow) for recreation, wildlife, and fish, but not for plants.96 A person in California may obtain a right to surface water (including the water in subterranean streams) for “wetlands habitat, fish and wildlife or recreation in or on the water.”97

Sub-irrigated riparian habitat no doubt benefits wildlife.98 Nevertheless, it remains to be seen whether courts would recognize that wildlife is a beneficial use of subflow when wildlife only uses the subflow indirectly. A similar problem exists with claiming that recreation is the beneficial use. People may enjoy walking beneath trees and observing the wildlife that lives in

98 See section II, supra.
the habitat, but no one is directly using groundwater to recreate. The recreational use of groundwater by birdwatchers who watch birds nesting in sub-irrigated riparian habitat is quite different from the recreational use of surface water by a canoeist who paddles along a flowing stream. An even greater problem can be found in the California statute which requires that the beneficial use be “recreation in or on the water.” As a result, California law might not recognize bird watching in riparian habitat as a recreational use of water.

Unlike the Arizona statute, California recognizes wetland habitat as a beneficial use of water. The California Water Code defines wetlands as “lands that may be covered periodically or permanently with shallow water and include saltwater marshes, freshwater marshes, open or closed brackish water marshes, swamps, mudflats, fens, and vernal pools.” Some riparian habitat is periodically flooded and so may meet the definition of wetlands. On the other hand, wetland and riparian habitat are different. Wetlands support hydrophytes, species which live in “wholly or partially submerged in water with roots in saturated soil that is intermittently submerged.” Riparian areas support phreatophytes, plants that send their roots down to the water table or the capillary fringe immediately overlying the water table. If the water table rises rapidly, cottonwood trees, a phreatophytic species, can die, while wetland hydrophytes will not be thrive. Similarly, in two other portions of the California code where wetland habitat appears, it is part of a phrase “riparian and wetlands habitat(s).” The fact that riparian and wetland habitat are associated with each other suggests that they are similar but distinct concepts.

99 Id.
100 Compare Ariz. Rev. State § XXX to Cal. Water Code § 1707(a)
Thus, it is likely that a water rights holder in California who wishes to protect sub-irrigated riparian habitat would need to claim a beneficial use of wildlife or recreation. But this is the same argument that would have to be overcome in Arizona and could be struck down on the grounds that the benefit to wildlife or recreation is too attenuated.

iv. Appropriating a level of water rather than a quantity

The final problem with obtaining a right to groundwater for the purposes of riparian habitat is that the appropriator is not appropriating a particular quantity of water that will be used by the riparian vegetation. Rather, the appropriator needs a right to maintain a particular depth to groundwater. There is little if any precedent that groundwater elevations may be appropriated.

Perhaps the only case where groundwater elevations were found to be appropriate under state law involved a claim by the federal government in the Great Sand Dunes National Park in Colorado. Although the groundwater was found on federal land, the case did not involve federal reserved rights. Rather, the United States Congress had passed legislation specifically authorizing the federal government to acquire water rights “exclusively for the purpose of maintaining ground water levels, surface water levels, and stream flows on, across, and under the national park and national preserve.” As a result, the Colorado court ruled that “this

---

104 Strictly speaking, sub-irrigated riparian habitat does use and consume groundwater; however, the gallons of consumption is much less significant than the position of the groundwater.

105 “Groundwater elevation” is the height of the water table with reference to a standard benchmark. When the water table falls, the groundwater elevation decreases. Thus, an appropriative right to a groundwater elevation would guarantee the holder a right to enjoin future uses of water that lower the water table.

106 As is discussed in section IV.a, supra, it is almost certain that the federal government can obtain property right to groundwater levels under the reserved rights doctrine. However, this doctrine only applies to federal lands that have always been in the public domain.


108 Id. at 20. The absence of federal reserved rights appears to be caused in part by the fact that much, if not all of the land that comprised the National Park was purchased from non-federal parties. Federal Reserved Rights are discussed in section IV, infra.

appropriation does not and cannot establish a precedent for any future appropriation within Colorado.”

Nevertheless, a decision may be persuasive even though it is not precedential. In the decision, the court explained that the water right was necessary “to preserve and protect aquatic, riparian, wet meadow and marsh communities, including wildlife populations dependant thereon, from new man made declines in water table.” With such a statement, the court has given some support to the legal argument that an appropriation of groundwater elevations for the protection of riparian habitat is reasonable.

It is unclear whether Arizona courts would allow the appropriation of groundwater levels. Under *Southwest Cotton*, the farmer had rights to a quantity of subflow, not a water level. Similarly, when applying for a permit to appropriate surface water, the Arizona Department of Water Resources requires an applicant to specify the quantity of water used by the appropriator.

On the other hand, even though the ADWR asks for a quantity of water in its applications, it might not be required in all circumstances. Although Arizona Statute specifies that an appropriator of surface water must state *inter alia* “the nature and amount of the proposed use,” the Arizona Court of Appeals has ruled that at least two of the items that an appropriator “shall” state in her application are not always required. For example, the Arizona statute requires that an application for surface water “shall” include the “location [and] point of

---

110 *In Re Application* at 18.
111 Id. at 14.
112 *Maricopa County Municipal Water Conserv. Dist v. Southwest Cotton Co.* (Southwest Cotton), 4 P.2d 369, 382 (Ariz. 1931)
113 Recall that, under Arizona law, subflow is treated as surface water.
diversion”\textsuperscript{116} but in \textit{Phelps Dodge Corp. v. Ariz. Dept. of Water Resources} the appeals court ruled that, neither a diversion of water nor the construction of diversionary works were required in an application to appropriate flows for wildlife.\textsuperscript{117} The court noted that “[a]lthough an applicant may list a point of diversion and the time frame for completing works… the logical reading of these requirements is that they must be provided only if relevant to the proposed use.”\textsuperscript{118} Here, as sub-irrigated riparian habitat is not dependent on a quantity of water, it may not be necessary for an appropriator of subflow to state a quantity in her application.

\textit{Phelps Dodge} signals that Arizona courts may be willing to recognize nontraditional attributes of appropriative rights as long as the rights fulfill a beneficial use. Because no statute specifically requires a diversion to effectuate the use, the court ruled that diversion was not required. Rather, the court noted that in \textit{England v. Ally Ong Hing}, the Arizona Supreme Court recognized that a farmer could obtain an in-stream flow of water by driving cattle to a creek to drink.\textsuperscript{119} \textit{England} establishes that an appropriator need not divert water in order to appropriate it and suggests that the \textit{presence} of water can be appropriated. Much like riparian vegetation, the key attribute of the water appropriated in \textit{England} was not the quantity (there is no suggestion that the farmer quantified the amount of water that his cattle drank) but the fact that it was there and was deep enough to deep enough for the cattle to lap it up. Indeed, the court notes that springs which merely “ooze or percolate out of the ground” are not large enough to be appropriable.\textsuperscript{120} The difference between an oozing stream and a flowing stream has less to do with the quantity of water than the depth of the water. Thus, \textit{England} provides useful precedent

\textsuperscript{117} 118 P.3d 1110 (Ariz. App. 2006).
\textsuperscript{118} Id. at 1113.
\textsuperscript{119} 459 P.2d 498 (Ariz. 1969)
\textsuperscript{120} Id. at 505.
for an argument that the depth of the water and hence the elevation of the subflow may be appropriated.

The most damaging counter argument to any claim that subflow depths are appropriable is the fact that the ADWR has not yet recognized such a right. In *Phelps Dodge*, the court explained that, “[i]n cases in which the ADWR has consistently interpreted a statute related to water rights, we will afford that interpretation, ‘great weight in the absence of clear statutory guidance to the contrary.’”

Because the ADWR requires that an appropriator apply for a particular quantity of water and does not have a mechanism to apply for a depth of water, it may be very hard to get a court to accept such a right.

Regarding California law, at least one commentator has written that “overlying owners do not have a right to the maintenance of the natural water table.” However, the case that the commentator cited may be read for the opposite proposition. In *Hillside Water Co.*, the California Supreme Court denied the right of farmers to maintain a shallow water table but granted the farmer compensatory damages. *Hillside Water Co.* concerned farmers whose crops received water directly from the aquifer (much like riparian habitat, they were “sub-irrigated). Once the City of Los Angeles started exporting groundwater from the area, the water table dropped and the farmers’ crops were harmed. The farmers sued to enjoin the pumping but the California Supreme Court rejected their demand, ruling that “compensation in lieu of injunction is preferred.”

121 *Phelps Dodge Corp.*, 118 P.3d at 1116.
123 *Hillside Water Co. v. City of Los Angeles*, 76 P.2d 681 (1938)
124 Id. at 677.
The court in *Hillside Water Co.* never stated that the farmers had *no* rights to the water table; rather it held that the use was a beneficial one.\(^{125}\) The court explained, “[i]t is readily seen that the use of this underground supply as an undersupport for irrigation or other surface uses would minimize the requirements of surface irrigation and result in benefit to the surface soil and crop conditions.”\(^{126}\) *Hillside Water Co.* does not stand for a rule that there is no right to protect groundwater levels but a rule that an injunction should not impair a public use of groundwater unless no other relief is adequate.\(^{127}\) In *Hillside Water Co.*, other relief was adequate because the farmers had rights to lower quality surface water from the Owens River\(^{128}\) and the city could compensate them for the loss in land value. On the other hand, if riparian habitat provides a critical resource for wildlife, there may not be an appropriate form of relief and an injunction may be appropriate.\(^{129}\) In such a case, the California courts might be persuaded to grant a property right to groundwater elevations within a subterranean stream.

**v. Can a landowner protect sub-irrigated riparian habitat using state law?**

In Arizona and California, it is not clear whether public and private landowners will be able to use the state property rights system to maintain high quality sub-irrigated riparian habitat. Both states have imposed multiple barriers that will make it exceedingly difficult to obtain a property right in groundwater levels. A private or public landowner who wishes to obtain such a property right would have to surmount the following obstacles.

In Arizona, the owner would have to establish that the groundwater on his or her property is defined as subflow. For subflow, there must be saturated floodplain Holocene alluvium.

---

\(^{125}\) See *Id.* at 686 (noting “it may not be rightly said that such use is not a beneficial use of the underground waters”)

\(^{126}\) *Id.*

\(^{127}\) *Id.* at 677. The court also noted that the City of Los Angeles owned 98% of the land area in the aquifer and reasoned that needs of 2% of the aquifer should not trump the needs of the majority owner. *Id.* at 685-86.

\(^{128}\) *Id.* at 685 (although the court noted that the crops were not as productive when irrigated with surface water).

\(^{129}\) Additionally, the interfering use may be a private use, not a public one, thereby distinguishing it from *Hillside Water Co.*
Subflow cannot exist along ephemeral streams or within 200 feet of the floodplain alluvium of ephemeral streams. Subflow cannot exist within 100 feet of the “basin fill” geologic formation. Subflow cannot exist within 200 feet of a connecting tributary aquifer-- a rule which may exclude all groundwater located next to gaining streams.

Once the landowner establishes that the riparian habitat is associated with subflow, the landowner must be able to convince a court that the habitat represents a beneficial use, even though plants are not recognized as a beneficial use under state law. Next, the landowner must convince a court that the law allows her to appropriate not just a quantity of subflow, but a particular depth to groundwater. Only at that point would the landowner be able to obtain a legal right to the water that is necessary to sustain the riparian habitat on her own property!

In California, a property owner would have to ensure that the groundwater is flowing in a subterranean stream. On the plus side, it is probably possible to locate a subterranean stream under a surface stream that is only ephemeral. Also, subterranean streams do not contract in the presence of other geologic formations or occasional inflows from outside of the subterranean stream’s underground banks. On the other hand, a subterranean stream must have a definable bed and banks that are relatively impermeable to water. In the *North Gualala* case, the bed and banks through which the subterranean stream flowed was 300 to 1000 times less permeable than the overlying alluvium.\(^{130}\) Once the landowner can prove the existence of a subterranean stream, he will have to establish that the habitat constitutes a beneficial use of the water. Then he will have to convince a court to allow him to appropriate a particular depth to groundwater. Finally, the California landowner could not initially appropriate the water for the habitat; rather, he would have to appropriate the water for a consumptive use and then transfer the use to a non-consumptive use of wildlife or recreation.

\(^{130}\) 139 Cal. App. 4th at 1598 n. 15.
IV. **Protection of sub-irrigated riparian habitat under the federal reserved rights doctrine**

Most water in the United States is governed by state water law; however, one important exception applies to federal reserved rights. Federal reserved rights are water rights expressed or implied by Congress on federal reserves-- lands which Congress has taken out of the public domain for one reason or another. Indian Reservations, Military Reservations, National Forests, National Parks, National Monuments, and National Wildlife Areas are all federal reserves. Lands which the federal government purchased from non-federal parties\(^\text{131}\) and most lands managed by the Bureau of Land Management\(^\text{132}\) are generally not federal reserves.

**a. Protecting a purpose, not simply a quantity**

When the federal government reserves land, it reserves all of the water necessary to accomplish the purposes of the reservation. A reserved right may describe a depth of water instead of, or in addition to a quantity. In *Cappaert v. United States*, the United States Supreme Court held that the federal government had the right to enjoin private parties whose groundwater pumping was lowering the water level in an underground pool where an endangered fish (the desert pupfish) lived.\(^\text{133}\) The Court held that “…as of 1952 when the United States reserved Devil’s Hole, it acquired by reservation water rights in unappropriated appurtenant water sufficient to maintain the level of the pool to preserve its scientific value and thereby implement Proclamation No. 2961.”\(^\text{134}\)

\(^{131}\) Federal land which was formerly private land or managed by a state or its subdivisions is governed by state law.  
\(^{132}\) Most of the land managed by the Bureau of Land Management (BLM) has never been reserved by congress; however congress and the president have reserved particular water sources, such as wells and springs, on BLM land. See W. Douglas Kari, Groundwater Rights on Public Land in California, 35 *Hastings Law Journal* 1007, 1013-15, 1984.  
\(^{133}\) 426 U.S. 128 (1976).  
\(^{134}\) *Id.* at 147.
The *Cappaert* Court articulated some important limitations to the implied federal reserved rights doctrine. First, the doctrine “reserves only that amount of water necessary to fulfill the purpose of the reservation, no more”\(^{135}\) *Cappaert* allowed the water table to drop, but only to such extent that it would not harm the desert pupfish.\(^ {136}\) Second, the federal reserved right vests on the date of the reservation.\(^{137}\) Because the Cappaerts started pumping after Devil’s Hole was reserved,\(^ {138}\) federal rights are superior to the rancher’s rights. Had the Cappaerts begun pumping before 1952, their rights would have been superior to the federal rights and it is likely that their pumping would not have been enjoined.\(^ {139}\)

Although the court held the United States can protect its water from both groundwater use and surface use by junior users,\(^ {140}\) it specifically declared that the water in Devil’s hole was surface water.\(^ {141}\) Thus, *Cappaert* does not specifically recognize the right of the federal government to reserve groundwater.\(^ {142}\) However, *Cappaert* did hold that “The United States is not bound by state water laws when it reserves land from the public domain.”\(^ {143}\) The Arizona Supreme Court has since held that the federal government has the ability to reserve groundwater even though groundwater is not appropriable under state law.\(^ {144}\) The Montana Supreme Court

---

\(^{135}\) *Id.* at 141 citing *Arizona v. California*, 373 U.S. 546, 600-01 (1963).

\(^{136}\) *Id.* The decision noted that before the Cappaerts began pumping groundwater, the water level was 1.2 feet below a copper marker. As long as the water level was 3.0 feet below the marker or higher, a rock shelf in the cave is below water, allowing the pupfish to spawn. *Id.* at 133-34. Thus, the decision allowed the allowed the water level to drop from 1.2 feet below the marker to 3.0 feet below the marker, but no further. *Id.* at 136.

\(^{137}\) *Id.* at 138.

\(^{138}\) See *Id.* at 131, 133.


\(^{140}\) *Id.* at 143.

\(^{141}\) *Id.* at 142.


\(^{143}\) *Id.* at 137.

\(^{144}\) *In re General Adjudication of All Rights to Use Water in Gila River System and Source*, 989 P.2d 739, 748 (Ariz. 1999) (hereinafter *Gila River III*). The Court did not determine the existence of such a right but stated that such a right could exist. *Id.*
has subsequently adopted Arizona’s approach. However, an Arizona court also held that “[a] reserved right to groundwater may only be found where other waters are inadequate to accomplish the purpose of a reservation.”

A federal reserved right to groundwater could easily be used to protect sub-irrigated riparian habitat. Unlike state water law, which may require that a particular quantity of water be appropriated, federal reserved rights can specify a particular water level. Like the desert pupfish, riparian habitat requires that a particular water level be maintained. Also, by definition, sub-irrigated riparian habitat depends on groundwater and not surface water. Thus, groundwater may be essential if maintaining the quality of the sub-irrigated riparian habitat is one of the primary purposes of the reservation.

b. Defining “Purpose”

Whether a reserved right exists to protect sub-irrigated riparian habitat will generally hinge on whether riparian conservation would fulfill the “purpose of the reservation.” In United States v. New Mexico, the Supreme Court indicated that courts should construe the purpose of a reservation narrowly. New Mexico involved a stream adjudication proceeding where “the United States claimed reserved water rights for use in the Gila National Forest.” The United States claimed that its reserved rights included enough water necessary for

---

146 Gila River III, 989 P.2d at 748. But see In Re General Adjudication of Big Horn River System, 753 P.2d 76, 99 (Wyo. 1988), aff’d by an equally divided Court sub nom. Wyoming v. United States, 492 U.S. 406 (1989) (Holding that a federal reserved right to groundwater does not exists. The Wyoming Court’s explanation for its holding was that “not a single case applying the reserved water doctrine to groundwater is cited to us.” The Arizona Supreme Court rejected this reasoning and, of course, such decisions do now exist. Gila River III, 989 P.2d at 746."
147 For a discussion on the distinction between appropriating a quantity of water and appropriating a depth of water, see section III.b.iv, supra.
148 Cappaert, 426 U.S. at 141.
149 Gila River III, 989 P.2d at 748.
150 Cappaert, 426 U.S. at 141 citing Arizona, 373 U.S. at 600-01.
152 Id. at 698.
recreation, aesthetics, wildlife preservation, or cattle grazing. The New Mexico Supreme Court disagreed and the United States Supreme Court affirmed. Writing for the majority, Justice Rehnquist explained that, by creating a federal reservation, Congress impliedly reserves water to fulfill the reservation’s primary purpose. However,

Where water is only valuable for a secondary use of the reservation…there arises the contrary inference that Congress intended, consistent with its other views, that the United States would acquire water in the same manner as any other public or private appropriator.  

Regarding the National Forests, the Court concluded that “they were only to be reserved for two purposes- ‘[t]o conserve the water flows and to furnish a continuous supply of timber for the people.’” The court looked to the Organic Administration Act of 1897 to find the National Forests’ purpose and not the Multiple-Use Sustained Yield Act of 1960, which states that National Forests are to be administered for “outdoor recreation, range, timber, watershed, and wildlife and fish purposes.” The court held that the 1960 act merely established “secondary purposes” of the reservation.

In order for the federal government to protect sub-irrigated riparian habitat on a federal reservations, land managers must look to the primary purpose of the reservation. If the enabling legislation for the federal reservation expresses a need to protect riparian habitat, there is a good chance that the managers of the reservation can secure a federal reserved right. Land managers may also be able to protect sub-irrigated riparian habitat if the land was reserved for another purpose that requires the continued existence of a shallow water table. On the other hand, if

---

153 Id. at 702 (emphasis added).
154 Id. at 707-08.
155 Id. at 713, 713 n. 21.
156 Id. at 715.
157 For example, if the reservation was created for the purpose of protecting wildlife, and the wildlife living within the reservation are dependent on sub-irrigated riparian habitat, the federal reserved right likely encompasses a depth to groundwater.
none of the primary purposes of the federal reservation requires a shallow water table, federal
reserved rights cannot be used to protect sub-irrigated riparian habitat.

c. A brief analysis of some federal reservations

As noted by the Arizona Supreme Court, “[t]o determine the purpose of a reservation and
to determine the waters necessary to accomplish that purpose are inevitably fact-intensive
inquiries that must be made on a reservation-by-reservation basis.”\textsuperscript{158} The enabling legislation of
some preserves explicitly mentions the conservation of riparian habitat as one of the purposes of
the reservation.\textsuperscript{159} However, even when the enabling legislation mentions riparian habitat, the
language of the legislation varies in significant ways. Some laws state that the purpose is to
“conserve, protect, and enhance” the riparian area while one states that the purpose is to merely
“protect” the area.\textsuperscript{160} This latter purpose would not necessarily lead to a reserved right to
shallow groundwater because a drop in the water table will often degrade riparian habitat but not
eliminate it altogether. On the other hand, if a primary purpose of the reservation is to “enhance”
riparian areas, the quality of the riparian areas is implicated. With such language, land managers
may have a better chance at protecting sub-irrigated riparian habitat, and preventing groundwater
withdrawals that would degrade the habitat.

The United States has recently made a reserved rights claim for the San Pedro Riparian
National Conservation Area (SPRNCA) in Arizona.\textsuperscript{161} As part of this claim, the U.S. is claiming

\textsuperscript{158} Gila River III, 989 P.2d at 748 citing New Mexico, 438 U.S. at 700.

National Conservation Area); Las Cienegas National Conservation Area-- Arizona, PL 106-538 § 4(a) (2000); 16
460ccc-1(a)(1) (2010) (purposes of the Red Rock Canyon National Conservation Area in Nevada); Proclamation

\textsuperscript{160} Compare PL 106-538 § 4(a); 16 U.S.C. § 460ddd(a); 16 U.S.C. 460ccc-1(a)(1) with PL 100-696 § 101; 65 Fed.
Reg. 2817, 2817-18.

\textsuperscript{161} Need cite.
a right to current water table elevations. As discussed, supra, much of the riparian area within SPRNCA consists of high value Cottonwood-Willow forests that depend on a depth to groundwater of less than three meters. If the water table falls below three meters, the dominant trees will change, but the riparian area won’t disappear. Congress established SPRNCA “[i]n order to protect the riparian area and the aquatic, wildlife, archeological, paleontological, scientific, cultural, educational, and recreational resources of the public lands surrounding the San Pedro River in Cochise County, Arizona…” In order for SPRNCA’s reserved rights claim to succeed, its land managers must establish that a primary purpose of the reservation is to protect high-quality Cottonwood-Willow forest and that other types of riparian habitat will not do.

Some federal reservations do not mention riparian habitat explicitly, but mention other ecological values that encompass riparian habitat. For example, Congress established the Santa Rosa and San Jacinto Mountains National Monument in Southern California “In order to preserve the nationally significant biological, cultural, recreational, geological, educational, and scientific values” present in the area. This monument includes palm oases along non-perennial streams. If monument managers argue that these riparian oases are a nationally significant biological value, they may be able to obtain a reserved right to groundwater levels.

---

162 Id.
163 See note Error! Bookmark not defined., supra.
164 Cottonwoods and willow trees will likely be replaced with trees like velvet mesquite that can tap into water at much greater depths.
166 Santa Rosa and San Jacinto Mountains National Monument Act, PL 106-351 § 2(b) (2000).
168 On the other hand, the Act also states that the monument designation “is not intended to impact upon existing or future growth in the Coachella Valley [the area surrounding Palm Springs, California]” which might weaken land manager’s claims. PL 106-351 § 2(a)(5).
Park managers may be able to secure federal reserved rights for sub-irrigated riparian habitat on many of the National Parks in the Southwest. The purpose of national parks “is to conserve the scenery and the natural and historic objects and the wildlife therein and to provide for the enjoyment of the same… unimpaired for the enjoinder of future generations.” Sub-irrigated riparian habitat is a natural object and is part of the scenery; healthy sub-irrigated riparian habitat helps conserve wildlife. Additionally, the purpose of the parks includes ensuring that those values remain “unimpaired.” The degradation of riparian habitat (say, from Cottonwood-Willow forest to Mesquite bosque) would not be consistent with the purpose of the National Parks.

Notwithstanding New Mexico, there may be a way to obtain a reserved right to protect sub-irrigated riparian habitat on National Forest Lands. Scientists have found that strips of Fremont Cottonwood reduce flood flows and the deposition of sediment. As one of the two primary purposes of National Forests is to secure “favorable” conditions of water flows, the loss of Cottonwood Forest may induce flooding, which is likely not a “favorable” condition. If a National Forest can demonstrate that securing favorable flows depends on the presence of cottonwood trees, it would be able to reserve a shallow water table.

d. Suggestions for federal land managers

Compared to state law in Arizona and California, the Federal reserved rights doctrine makes it much easier for the federal government to protect sub-irrigated riparian habitat on reserved federal land. However, the federal government still has to assert its rights. Federal land managers need to keep in mind that they likely have a right to groundwater, and when riparian

---

170 James Henson, Plant Fact Sheet: Fremont’s Cottonwood, United States Department of Agriculture, Natural Resource Conservation Service (Feb. 2002).
habitat grows along non-perennial streams, preserving that habitat often requires adequate groundwater levels. Currently, the Department of Justice is asserting a federal reserved right to groundwater levels along the San Pedro River in Arizona’s general stream adjudication. This process should be repeated in other federal reservations even when the enabling legislation does not explicitly mention riparian values. Wherever federal land is reserved to protect the “wildlife,” “ecology,” or “scenery,” of a desert ecosystem, land managers should recognize that the primary purpose of the reservation cannot be fulfilled without protecting riparian habitat. Even National Forests, which lack a reserved right to in-stream flows, may be able to obtain reserved rights to groundwater if their managers can show that sub-irrigated riparian habitat helps secure favorable water flows.

V. **Suggestions for legislative changes**

Current law may help protect some sub-irrigated riparian habitat, but it will need to be changed in order to protect much of the remaining high value riparian habitat in the Southwest. In Arizona and California, sub-irrigated riparian habitat is at risk largely because water law is bifurcated between surface water and groundwater. The best thing that could happen for sub-irrigated riparian habitat would be for the state legislatures specifically recognize an appropriative right to a depth of groundwater, thereby preventing future appropriators from lowering water table. Additionally, any effort to integrate groundwater law with surface law would make it easier to maintain and raise current groundwater levels in those states. Of course, given that the basic system governing groundwater in these states has not changed for 100 years,\(^1\) it may be unrealistic to expect major changes in the near future. Nevertheless, some

---

\(^1\) A possible exception may be the Arizona Groundwater Management Act, but that law is only designed to protect groundwater levels under 20% of the land area of Arizona.
relatively minor changes would give conservation-minded landowners better tools to protect sub-irrigated riparian habitat.

One simple change would be for the Arizona and California legislatures to explicitly recognize the maintenance of riparian vegetation as a beneficial use of water. Such a change would enable landowners to devote water to riparian habitat without arguing that the water was for the indirect use of wildlife.

In Arizona, the legislature (or the courts) should provide a simpler definition of subflow which includes all of the saturated floodplain Holocene alluvium. The legislature should eliminate the complicated criteria that the ADWR has to consider other than the presence of certain sediment. Such a change would make the administration of subflow more predictable and would protect more rivers and more riparian habitat.

The California Water Board should learn from Arizona and embark on a process to delineate subterranean streams. As a state agency, it would be able to conduct the delineation process much more efficiently than private landowners or political subdivisions of the state. Additionally, it could serve as a neutral arbiter, and state courts would defer to its judgment.

California lawmakers should also amend the water code to allow public and private entities to directly appropriate water for non-consumptive uses. This would simplify the process of protecting shallow water tables.

The federal government has more power to protect sub-irrigated riparian habitat than any other landowner, especially in Arizona and California. However, Congress or the President must act to establish reservations. When establishing such a reservation, Congress or the President should use language similar to the following: “Reservation X is established for the purpose of maintaining and enhancing the quality of riparian habitat.” The word “quality” establishes that
there are different degrees of riparian habitat, and that low value riparian scrubland is not what the reservation seeks to protect. The word “maintain” means that the riparian habitat must not degrade. The word “enhance” signifies that the reservation ultimately seeks to improve the quality of the riparian habitat and, when it does, it the reservation will retain the right to enough groundwater to fulfill that purpose.

VI. Conclusion

Riparian habitat is extremely important in the Southwestern United States, both ecologically and economically. Much of this habitat is associated with non-perennial streams, where the absence of permanent surface water limits the level of protection that this habitat can receive. Unfortunately, the current legal landscape in Arizona and California make it very difficult for landowners to obtain the type of property right necessary to protect such habitat. Protection is easier under the federal reserved rights doctrine, but these rights only apply to federal lands where Congress has acted to protect riparian or other related ecological systems.

The business community and other individuals who wish to encourage economic growth often criticize government regulation because it constrains the use of private property. However, one of the most significant barriers to riparian conservation is the absence of an adequate system of property rights in water. Courts and legislatures in Arizona and California should recognize a legal right to appropriate groundwater levels near non-perennial streams. Doing so will cause only minimal disruption to the existing system of water rights. At the same time, public and private groups will have the tools that they need to protect as much riparian habitat as they can pay for.