

Using Conservation Easements to Save the Upper San Pedro River

Kevin J. Luster¹

*This article will discuss how Fort Huachuca, in cooperation with The Nature Conservancy and the Bureau of Land Management (BLM), has become the first Army installation to use conservation easements² to fulfill its responsibility under the Endangered Species Act to conserve endangered and threatened species dependent upon the Upper San Pedro River ecosystem.³ Fort Huachuca sits at the base of the Huachuca Mountains on the western fringe of the San Pedro River Valley in Cochise County, 60 miles southeast of Tucson and 15 miles north of Mexico. The Fort covers 73,142 acres of terrain at elevations ranging from 3,940 feet to 8,625 feet.⁴ © 2002 Wiley Periodicals, Inc.**

BACKGROUND

Fort Huachuca—From Calvary Post to the Home of Army Intelligence and Communications

The Department of War established Camp Huachuca in 1877 as one of 70 Army outposts stretching across the southwestern frontier, to protect local settlers and cut off the Apache escape route into Mexico. In 1886, four years after the War Department designated Camp Huachuca a permanent fort, Fort Huachuca provided troopers to help capture Geronimo and his band of Apaches in Sonora, Mexico. Following the Indian Wars, troopers from Fort Huachuca patrolled the Mexican border and, in 1916, units from Fort Huachuca, including the 10th Cavalry "Buffalo Soldiers" Regiment, accompanied Brigadier General John J. "Blackjack" Pershing during his punitive expedition into Mexico. During World War II, Fort Huachuca housed and trained over 25,000 African American soldiers from the 92nd and 93rd Divisions.⁵

After the war, the U.S. government closed Fort Huachuca and gave it to the State of Arizona to serve as a training area for the Arizona National Guard and for wildlife management. Arizona returned the fort to the Department of the Army during the Korean War, and it reopened in 1954 as the headquarters of the U.S. Army Electronic Proving Ground. Today, Fort Huachuca is the home of the U.S. Army Intelligence Center, the U.S. Army Signal Command, the U.S. Army Electronic Proving Ground, the Joint Interoperability Test Command, and the U.S. Army Information Systems Engineering Command.⁶ Its moderate, year-round climate,

Lieutenant Colonel Kevin J. Luster is assistant staff judge advocate at Fort Huachuca, Arizona.

clean air, and pristine electromagnetic spectrum make it a perfect location for testing electronic systems, test-flying unmanned aerial vehicles, and training military intelligence soldiers. Fort Huachuca has a noon-time population of roughly 15,500, consisting of approximately 4,200 assigned military, 3,000 military students, 4,000 military family members, and 4,300 civilian employees.⁷

The Upper San Pedro River Basin

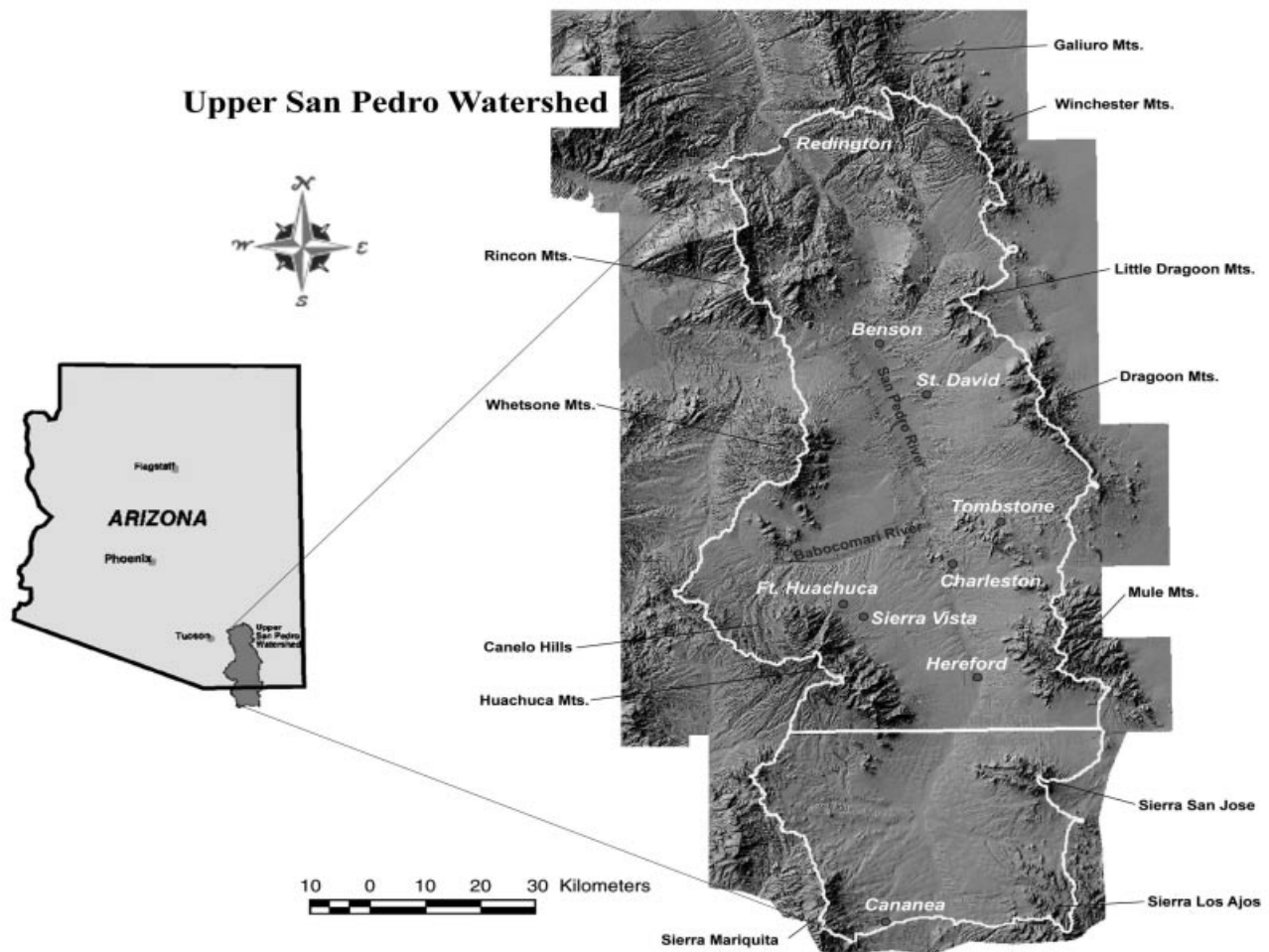
Fort Huachuca sits atop a regional aquifer that covers approximately 1,200 square miles, with a high desert watershed nestled between the Mustang and Huachuca mountains to the west and the Mule Mountains to the east.⁸ At its closest point, Fort Huachuca is less than a mile from the San Pedro River, which flows north from its headwaters in Sonora, Mexico, to southeastern Arizona. The San Pedro River is one of the few remaining perennial rivers in the southwestern United States. Though the river receives seasonal flow from precipitation and snowmelt, it depends primarily on groundwater to sustain its baseflow.⁹ The river covers two geographic units: the upper and lower basins. The Upper San Pedro River Basin supports an ecosystem that rates the second highest in diversity of land mammals in the world (see **Exhibit 1**). It also provides habitat for nearly 390 different species of birds, many of which are migratory.¹⁰ In 1988, recognizing the importance of the basin's unique biodiversity, Congress created the San Pedro Riparian National Conservation Area (SPRNCA), which consists of approximately 57,000 acres stretching 36 miles along the Upper San Pedro River from Mexico north to St. David, Arizona.¹¹ The BLM manages the SPRNCA, which provides critical habitat for two endangered species: a bird, the Southwestern willow flycatcher, and a plant, the Huachuca water umbel. It also provides habitat for two threatened native fish: the spikedace and the loach minnow.¹

Two subwatersheds support the Upper San Pedro River Basin: the Sierra Vista and Benson Subwatersheds. Fort Huachuca, the City of Sierra Vista, nearby Huachuca City, and most of the SPRNCA make up the Sierra Vista Subwatershed.¹³ The region's residents, including Fort Huachuca, depend entirely on groundwater.¹⁴ In 1991, the Arizona Department of Water Resources (ADWR) estimated that, with an annual precipitation ranging from 14–26 inches, the annual water supply into the Sierra Vista Subwatershed was 56,820 acre-feet.¹⁵ The ADWR also estimated that approximately 39,200 acre-feet flow out of the system as surface flow in the San Pedro River and 28,850 acre-feet a year is withdrawn for consumptive use, resulting in a deficit of 11,230 acre-feet per year.¹⁶ Even though the area's population has increased in the past ten years, local reductions in agricultural pumping have reduced the subwatershed's estimated water deficit to roughly 7,000 acre-feet per year.¹⁷ According to the 2000 U.S. Census, 37,775 people live in the City of Sierra Vista, 1,751 people live in Huachuca City, and 117,755 people live in Cochise County.¹⁸ Roughly 9,000 people currently live on Fort Huachuca.¹⁹ Currently, there are approximately 500–900 acres of irrigated agricultural land in the subwatershed, which pumps between



The Upper San Pedro River Basin supports an ecosystem that rates the second highest in diversity of land mammals in the world.

Exhibit 1. Upper San Pedro Watershed



Source: Directorate of Installation Support, U.S. Army Garrison, Fort Huachuca, Arizona

1,500 to 2,800 acre-feet of water each year.²⁰ This leaves approximately 7,900 to 6,600 acre-feet annually attributable to non-agricultural human consumption within the subwatershed.

The 1999 Biological Opinion

In 1995, Fort Huachuca began formally evaluating the potential effects of ongoing military operations and activities at Fort Huachuca on the federally listed threatened and endangered species on and off the post.²¹ On March 30, 1998, Fort Huachuca submitted to the U.S. Fish and Wildlife Service (FWS) a biological assessment, which determined that the fort's ongoing actions "may affect, but are not likely to adversely affect" the Huachuca water umbel (off-post), the Canelo Hills ladies' tresses, the Southwestern willow flycatcher, the loach minnow, and the spikedace. The biological assessment also concluded that the fort's



... the FWS infers in the biological opinion that the fort is responsible for 3,447 acre-feet of water pumped off-post each year. The fort's figure is a bit less.

operations were “likely to adversely affect” the Huachuca water umbel (on-post), the Blumer’s dock, the peregrine falcon, the Mexican spotted owl, the lesser long-nosed bat, and the Sonora tiger salamander.²² This prompted the fort to request formal consultation with the FWS under Section 7 of the Endangered Species Act on the potential effects of the fort’s ongoing activities on the endangered and threatened species in the area.²³ In late 1998, the FWS issued a draft biological opinion that concluded that deficit groundwater pumping is the greatest threat to threatened and endangered species in the region. The FWS feared that if deficit groundwater pumping were left unabated it would ultimately reduce and dry up the Upper San Pedro River. The draft biological opinion listed reasonable and prudent alternatives to the fort’s activities, alternatives that essentially proposed that the fort assume responsibility for eliminating the groundwater deficit for the entire subwatershed.²⁴ The fort objected to the draft biological opinion because it had neither the resources nor the authority to mitigate the groundwater deficit for the entire subwatershed.²⁵

Through extensive consultations over the next ten months, the FWS and Fort Huachuca negotiated a memorandum of agreement listing several measures the fort could undertake to reduce on-post water use and address the regional water deficit. The agreement enabled the FWS, after 19 months of formal consultations, to issue its biological opinion on October 27, 1999. The biological opinion, covering all ongoing and planned military activities at and near Fort Huachuca for the next ten years, incorporated the memorandum of agreement. In the biological opinion, the FWS concurred with the fort’s earlier determination that activities at the fort were not likely to adversely affect the spikedace, loach minnow, or Canelo Hills ladies’ tresses. It also concluded that Fort Huachuca’s activities over the next ten years were not likely to jeopardize the continued existence of the Huachuca water umbel, Southwestern willow flycatcher, Mexican spotted owl, lesser long-nosed bat, or Sonora tiger salamander, or adversely affect critical habitat for the Southwestern willow flycatcher or Huachuca water umbel.²⁶

In the biological opinion, the FWS did not hold the fort responsible for the area’s estimated annual water-pumping deficit of 7,000 acre-feet. Instead, the FWS estimated that approximately 34,530 people lived in the subwatershed because of the fort’s presence. It calculated that, at 150 gallons per day for per capita use, 34,530 people would consume roughly 5,802 acre-feet each year ($34,530 \times 150 \times 365 = 1,890,517,500$ gallons or 5,802 acre-feet).²⁷ According to the FWS, this amount represents approximately 62 percent of all groundwater pumped from the subwatershed.²⁸ As a baseline from which to judge the fort’s progress under the biological opinion, the FWS applied the fort’s on-post water use in 1996: 2,355 acre-feet.²⁹ Consequently, the FWS infers in the biological opinion that the fort is responsible for 3,447 acre-feet of water pumped off-post each year. The fort’s figure is a bit less. The fort believes that only 2,766 acre-feet of water is pumped off-post annually because of the fort’s presence in the subwatershed.³⁰



... the fort has progressively reduced its water use over the past four years, even though its population has increased.

To mitigate the potential effects of deficit groundwater pumping on threatened and endangered species in the Sierra Vista Subwatershed of the Upper San Pedro River Basin, Fort Huachuca agreed to undertake several measures in the memorandum of agreement.³¹ One of these measures included working with regional partners in the Upper San Pedro Partnership³² to develop a regional plan for water resources management to maintain the baseflow of the San Pedro River. Other measures included developing an Army Water Resources Management Plan, developing annual work plans with the FWS to further the goals of the agreement, implementing scheduled water-management projects, and implementing measures listed in appendixes A and B to the agreement.³³ Appendix A is the Army Water Resources Management Plan. Its stated purpose is to “maintain the Army’s mission at Fort Huachuca while protecting and maintaining populations of listed species and their habitats.” The plan obligates Fort Huachuca to reduce its net water consumption over the next ten years through water conservation and recharge projects.³⁴ Appendix B to the agreement lists the fort’s requirements under the biological opinion, such as species and habitat monitoring, fire management, restrictions on various military and recreational activities, and other general mitigation measures to reduce adverse effects to listed species and their habitats.³⁵ Finally, the biological opinion stressed the importance of the City of Sierra Vista’s planned wastewater-recharge project for delaying any impact on the Upper San Pedro River from regional deficit pumping.³⁶

Achieving Zero-Balance

The memorandum of agreement and the Army Water Resources Management Plan committed Fort Huachuca to undertake aggressive water conservation, recharge, reuse, and other mitigation measures, and to cooperate with regional stakeholders through the Upper San Pedro Partnership to reduce, if not eliminate the annual water deficit in the Sierra Vista subwatershed. However, only through real, documented progress can the Army and the FWS determine whether these measures will work.³⁷ **Exhibit 2** below depicts the fort’s progress in reducing its on-post water use over the past several years. The fort has accomplished this reduction through extensive investments in water conservation technology, by aggressively conserving water, by reducing water leaks through a relentless leak-detection program, and by demolishing excess infrastructure.³⁸ As shown by the chart below, the fort has progressively reduced its water use over the past four years, even though its population has increased. The fort is also returning more water to the aquifer through projects that channel and capture stormwater, and recharge the aquifer with stormwater and treated effluent via settling or recharge basins. Currently, the fort recharges approximately 500 acre-feet per year with its current recharge efforts. It will soon increase this recharge by approximately 250 acre-feet annually through irrigation repairs, erosion control, and additional stormwater channeling. Additionally, the fort will soon complete

Exhibit 2. Fort Huachuca Population and Water-Use (Pumpage) History (Population data are from September 30 of each year)

<i>Year</i>	<i>On-Post Population</i>	<i>Noonday Population</i>	<i>Water Use in Acre-feet</i>
2001	N/A	15,826	1,655
2000	9,728	15,518	1,843
1999	8,584	15,466	1,893
1998	7,603	14,793	2,176
1997	7,760	14,850	2,357
1996	8,656	15,310	2,355
1995	8,982	15,842	2,428
1994	9,388	16,420	2,568
1993	8,534	16,183	3,028
1992	8,163	16,386	2,846
1991	8,410	16,195	2,709
1990	9,210	17,075	2,747
1989	9,204	17,133	3,207
1988	9,142	16,687	3,200
1987	9,667	16,960	2,470
1986	8,918	16,563	2,896
1985	8,887	16,778	2,984
1984	9,022	16,341	3,088
1983	9,860	16,360	2,874
1982	9,433	15,840	2,735

Source: Directorate of Installation Support, U.S. Army Garrison, Fort Huachuca, AZ



To fulfill its obligation under the biological opinion and memorandum of agreement, the fort must cooperate with local partners . . .

construction of seven recharge basins that may return as much as 1,000 acre-feet per year to the regional aquifer. Consequently, Fort Huachuca will eventually achieve zero-balance between its annual on-post water usage and the amount it recharges to the aquifer.³⁹ However, Fort Huachuca still faces the tremendous challenge of reducing and/or offsetting its share of the off-post water-pumping deficit—whether the deficit is 3,447 acre-feet annually or 2,766 acre-feet annually.

CONSERVATION EASEMENTS

Working with Partners

To fulfill its obligation under the biological opinion and memorandum of agreement, the fort must cooperate with local partners to reduce, if not eliminate, the locale's estimated annual water-pumping deficit of 7,000 acre-feet. The fort is working with the Upper San Pedro Partnership to identify and implement such projects as the City of Sierra Vista's effluent recharge project, conservation technology, public awareness campaigns, and reusing treated effluent to irrigate parks and golf courses.⁴⁰ Additionally, to substantially offset its off-post impact, the fort has joined with The Nature Conservancy and the BLM to undertake an innovative approach towards conservation within the Sierra Vista subwatershed.⁴¹

Cooperative Agreement

On February 14, 2000, less than four months after signing the memorandum of agreement with the FWS and receiving the final biological opinion, representatives from Fort Huachuca, The Nature Conservancy, and the FWS met to discuss potential acquisitions of conservation easements near the SPRNCA, including "the Gap," the section of private lands along the Upper San Pedro River that divides the SPRNCA.⁴² Much of the private lands in this rural area along the Upper San Pedro River are large parcels, often greater than 100 acres each, currently undeveloped and dedicated to ranching and farming. The BLM has already received a limited amount of funds through the Land and Water Conservation Fund to acquire lands and easements near the SPRNCA. Their goal is to establish an open-space corridor for wildlife to access the river, close "the Gap" separating the SPRNCA, and connect the SPRNCA with public lands in the Huachuca Mountains and Forest Reserve lands in Sonora.⁴³ This would ensure the continued vibrancy of the region's biodiversity by maintaining an unencumbered corridor for the region's wildlife. It would also protect those species most dependent upon the river by reducing groundwater pumping within the subwatershed, which is the greatest threat to the river's baseflow.⁴⁴ The FWS determined that Fort Huachuca could earn credits towards its obligation under the memorandum of agreement and biological opinion to reduce deficit water pumping by acquiring conservation easements through The Nature Conservancy that would complement the BLM's efforts.⁴⁵ The FWS proposed that these credits would equal the difference between the estimated water used on the acquired properties in 1990 and the projected water use on the properties under the easements.⁴⁶



The Nature Conservancy will identify lands that have a history of groundwater pumping for agricultural irrigation and/or possess a high potential for significant subdivision and development, either of which can contribute to the groundwater deficit and adversely impact the baseflow of the Upper San Pedro River.

On September 27, 2000, Fort Huachuca, through the U.S. Army Medical Research Acquisition Activity,⁴⁷ executed a cooperative agreement with The Nature Conservancy primarily to identify and acquire conservation easements within the Upper San Pedro River Basin.⁴⁸ The cooperative agreement has three stated objectives: (1) support the military mission at Fort Huachuca by protecting, maintaining, and enhancing threatened and endangered species and their habitat in the Upper San Pedro River Basin; (2) encumber private property land uses of willing landowners near the Upper San Pedro River Basin with conservation easements, and (3) improve long-term management of threatened and endangered species within the Upper San Pedro River Basin.⁴⁹

Under the cooperative agreement, The Nature Conservancy will identify lands that have a history of groundwater pumping for agricultural irrigation and/or possess a high potential for significant subdivision and development, either of which can contribute to the groundwater deficit and adversely impact the baseflow of the Upper San Pedro River.⁵⁰ The cooperative agreement requires The Nature Conservancy to obtain written permission from landowners before entering their properties to survey and appraise them.⁵¹ Additionally, The Nature Conservancy must obtain a certified land appraisal and complete a report describing the environmental baseline for each candidate property before drafting any easement. This report will establish the current conditions and use of the property, which will help calculate the credit-value of the easement and establish a baseline on which to monitor and enforce the easement.⁵² The Nature Conservancy works with the landowner to draft an easement that establishes long-term management guidelines to protect and enhance threatened and endangered species habitat.⁵³ Typical easement conditions will limit or prohibit agricultural irrigation on the property, restrict the landowner's right to subdivide the property, limit the number of structures on the property, and prohibit fencing that could impair wildlife movement. Limits on development rights are important because real property developed into quarter-acre lots can consume as much water per acre as irrigated agricultural lands. Furthermore, development can harm the river through erosion, sedimentation, and accelerated runoff.⁵⁴ Additionally, the easements will require the landowners to allow entry onto their land by the BLM representatives to monitor compliance with the easements.⁵⁵ After The Nature Conservancy negotiates, drafts, and acquires the easements, the Army will pay The Nature Conservancy for the costs of the easements, and The Nature Conservancy will in turn transfer the easements to the BLM to manage.⁵⁶

Recent Acquisitions

The first of the two parcels that The Nature Conservancy has already acquired under the cooperative agreement is the Clinton Ranch. In July 2000, The Nature Conservancy purchased the Clinton Ranch, a 940-acre parcel south of Highway 92, adjacent to the SPRNCA. Previous owners had irrigated 120 acres of this property to grow alfalfa, consuming 636.3



... the cooperative agreement has the very real potential of reducing the fort's share of the water-pumping deficit another 800 acre-feet to 1,509 acre-feet.

acre-feet of water annually. According to the FWS, the Clinton Ranch is key to creating an open space corridor between the SPRNCA and public lands to the west in the Huachuca Mountains.⁵⁷ Last year, The Nature Conservancy sold the 940-acre parcel with an easement against the property that prohibits agricultural irrigation and any structures other than a house with supporting buildings and a small garden. The new owners are renovating the house into a bed and breakfast. In July 2001, Fort Huachuca paid The Nature Conservancy \$760,700 for the easement, which is the difference between the amount that The Nature Conservancy originally paid for the property and the amount that it received from the subsequent buyers of the property with the easement attached. After The Nature Conservancy transferred the easement to the BLM to manage, the FWS tentatively agreed this past January to credit Fort Huachuca with conserving 630.8 acre-feet annually through the easement.⁵⁸

The second parcel is the Drijver tract, which is a 105-acre tract of land within "the Gap" that divides the SPRNCA. In August 2001, The Nature Conservancy purchased the Drijver tract, which had 75 acres of irrigated pasture that consumed approximately 508 acre-feet of ground-water in 1990. Because the tract is adjacent to the Upper San Pedro, the FWS believes that retiring the tract from irrigation will directly benefit the baseflow of the river.⁵⁹ Once The Nature Conservancy sells the tract with the appropriate easement, Fort Huachuca will reimburse The Nature Conservancy for the difference and will in turn transfer the easement to the BLM to manage. Any easement against the Drijver tract will prohibit irrigation for agriculture and subdivision for development. Fort Huachuca expects to pay approximately \$260,000 to obtain 507.2 acre-feet in water-savings credit from the Drijver tract. Finally, The Nature Conservancy is considering other tracts that may net over 800 acre-feet in water-savings credit for the fort. Together, these properties will enable the fort to offset its share of the off-post water-pumping deficit by over 1,900 acre-feet annually.⁶⁰

CONCLUSION

In less than three years, Fort Huachuca has made substantial progress towards achieving its goals under the 1999 biological opinion. It is close to achieving zero-balance between its on-post water consumption and the water it returns to the aquifer. To date, the cooperative agreement between Fort Huachuca and The Nature Conservancy has produced one conservation easement worth an annual credit of 630.8 acre-feet. Soon, it will produce a second easement that will likely earn the fort an additional 507.2 acre-feet credit from the FWS, for a total of 1,138 acre-feet. This reduces the amount of off-post water consumption that the FWS attributes to the fort to 2,309.⁶¹ Furthermore, the cooperative agreement has the very real potential of reducing the fort's share of the water-pumping deficit another 800 acre-feet to 1,509 acre-feet.⁶² Considering what the fort has also accomplished towards achieving a zero-balance between its on-post water use and recharge to the aquifer, this is tremendous progress within less than three years of the issuance of the biological opinion.

Of course, Fort Huachuca still faces challenges to achieving its goals under the 1999 biological opinion, and any subsequent biological opinion that it acquires from the FWS. First and foremost is that conservation easements alone cannot save the Upper San Pedro River. As noted above, current agricultural irrigation within the subwatershed consumes only between 1,500 to 2,800 acre-feet of water each year.⁶³ Consequently, there is a limit to the amount of the deficit that water conservation easements can reduce. Even so, Fort Huachuca should continue to receive credits for permanently retiring land from agricultural irrigation and development based on the land's historical use, potential for development, and proximity to the SPRNCA. This strategy will continue to reduce some of the deficit groundwater pumping impacting the river; however, it is also effective at managing future increases in groundwater pumping, especially when aimed at strategically located parcels—parcels that have the greatest potential of impacting the river's flow. Of course, this will require substantial knowledge of the region's hydrology. Though the region's hydrology is well beyond the scope of this article, know that it is both complex and controversial, and that the involved federal and state agencies and other interested parties are striving to better understand it. By acquiring conservation easements in cooperation with The Nature Conservancy and the BLM, Fort Huachuca is making substantial progress towards protecting the SPRNCA and the Upper San Pedro River Basin. It is also earning credibility with the FWS by making significant progress towards offsetting its impact on off-post water use. More importantly, Fort Huachuca is demonstrating leadership to its partners within the subwatershed on how to work together to save the Upper San Pedro River. ♦

NOTES

1. Lieutenant Colonel Luster is grateful to the following people who contributed to this article: Mr. Dan Haws, at the Office of the Staff Judge Advocate at Fort Huachuca; Ms. Gretchen Kent, at the Directorate of Installation Support, U.S. Army Garrison (DIS, USAG), Fort Huachuca; and Mr. Robert Bridges, at the DIS, USAG, Fort Huachuca.
2. Under the Arizona Uniform Conservation Easement Act, "'Conservation easement' means a nonpossessory interest of a holder in real property imposing limitations or affirmative obligations for conservation purposes or to preserve the historical, architectural, archaeological or cultural aspects of real property." Ariz. Rev. Stat. § 33-271 (2001).
3. Endangered Species Act of 1973 § 7, 16 USC § 1536.
4. Environmental assessment: Expansion of the West Civilian Personnel Operations Center, Fort Huachuca, Arizona (EA: WCPOC). (2001, August). Unpublished study on file with the DIS, USAG, Fort Huachuca, AZ. See p. 7.
5. Smith, C.C., Jr. (1976). Fort Huachuca: The story of a frontier post, pp. 172–74, 277–309.
6. *Id.* at 312.
7. EA: WCPOC, *supra* note 4, at 13.
8. *Id.* at 18–19. See also: U.S. Army Intelligence Center and Fort Huachuca. (2001). Integrated natural resources management plan and environmental assessment 2001–2005, at 25. Unpublished study on file with the DIS, USAG, Fort Huachuca, AZ.

9. Environmental Impact Statement: Approval of Land Use and Real Estate Investment Strategies in Support of Real Property Master Planning, Fort Huachuca, Arizona (EIS: Master Plan). (1999, May). Unpublished study on file with the DIS, USAG, Fort Huachuca, AZ. See 3-41 to 3-45. See also U.S. Department of Interior, U.S. Fish and Wildlife Service. (1999, October 27). Biological opinion: Ongoing and planned military operations and activities at and nearby Fort Huachuca [hereinafter 1999 BO], at 77-84. Unpublished document on file with the DIS, USAG, Fort Huachuca, AZ.
10. Harvard University Graduate School of Design. (2000, December). Summary report: Alternative futures for the Upper San Pedro River Basin, Arizona, U.S.A., and Sonora, Mexico, at 1. Unpublished report on file with the DIS, USAG, Fort Huachuca, AZ. See also Kingsolver, B. (2000, April). A special place: The patience of a saint, San Pedro River. *National Geographic*, 197(4), 81, 85.
11. 16 USC § 460xx. See also 1999 BO, *supra* note 9, at 74.
12. 1999 BO, *supra* note 9, at 74 and 127-29.
13. EA: WCPOC, *supra* note 4, at 18.
14. EIS: Master Plan, *supra* note 9, at 3-48 to 3-49. There are over 80 registered wells in the two townships adjacent to Fort Huachuca—all with depths exceeding 800 feet. The fort has eight high-capacity wells with depths between 710 and 1,230 feet. It also has five low-capacity wells supporting military testing and research throughout the post.
15. 1999 BO, *supra* note 9, at 82, citing: Arizona Department of Water Resources. (1991). Preliminary hydrographic survey report for the San Pedro River Watershed, Vol. 1, at 548. Phreatophytes (deep-rooted plants) accounted for approximately half of this consumption; consequently, human activities within the subwatershed consumed roughly 14,425 acre-feet annually. 1999 BO, *supra* note 9, at 82. Outside the subwatershed, agricultural irrigation and mining operations in Mexico may also impact the flow of the Upper San Pedro River. See *Id.* at 81. An acre-foot is 325,850 gallons, or the volume of water that would cover one acre to the depth of one foot (from Black's Law Dictionary, 5th ed., 1979).
16. *Id.*
17. 1999 BO, *supra* note 9, at 82.
18. According to the U.S. Census, in 1990, 32,983 people lived in the City of Sierra Vista, 1,782 people lived in Huachuca City, and 97,624 people lived in Cochise County. EA: WCPOC, *supra* note 4, at 12, citing the U.S. Census.
19. Directorate of Resource Management, U.S. Army Garrison, Fort Huachuca. (2001). Annual population survey.
20. 1999 BO, *supra* note 9, at 82, citing: San Pedro Expert Study Team. (1999). Report to the Secretariat of the Commission for Environmental Cooperation: Sustaining and enhancing riparian migratory bird habitat on the Upper San Pedro River.
21. Section 7(a)(2) of the ESA requires the Army, in consultation with the U.S. Fish and Wildlife Service, to "insure that any action authorized, funded, or carried out by [the Army] is not likely to jeopardize the continued existence of any endangered species or result in the destruction or adverse modification of habitat of such species . . ." To accomplish this, Army installations will typically prepare a biological assessment under Section 7(c)(1), which states in part: "To facilitate compliance with the requirements of subsection (a)(2) of this section, each Federal agency shall . . . conduct a biological assessment for the purpose of identifying any endangered species or threatened species which is likely to be affected by such action." 16 USA § 1536(a)(2). See also 50 CFR § 402.12, Biological assessments, which delineates the guidelines and procedures for preparing and coordinating biological assessments with the FWS.
22. Letter from Fort Huachuca to the U.S. Fish and Wildlife Service (March 30, 1998).
23. *Id.* Under formal consultation, the FWS evaluates the potential effects of the action on threatened and endangered species and any critical habitat, and prepares a biological opinion

on “whether the action, taken together with cumulative effects, is likely to jeopardize the continued existence of listed species or result in the destruction or adverse modification of critical habitat.” If the FWS finds jeopardy or adverse effects, it “shall suggest reasonable and prudent alternatives” that it believes the agency can apply to avoid violating Section 7(a)(2) of the ESA. ESA § 7(b)(3), 16 USC § 1536(b)(3). See also 50 CFR § 402.14(g)(4).

24. U.S. Department of Interior, U.S. Fish and Wildlife Service. (1998, December). Draft biological opinion: Ongoing and planned military operations and activities at and nearby Fort Huachuca.

25. Letter from Commander, USAIC&FH, to Field Supervisor, U.S. Fish and Wildlife Service (October 5, 1999). Essentially, the FWS expected the fort to assume responsibility for reducing water use in the subwatershed by 7,000 acre-feet per year. In 1998, the fort pumped only 2,176 acre-feet for on-post use.

26. Letter from USFWS to Col. Michael W. Boardman, Commander, USAG, Fort Huachuca, AZ (October 27, 1999), accompanying the 1999 BO.

27. 1999 BO, *supra* note 9, at 116–17. Fort Huachuca disagrees with the FWS—it believes that only 5,121 acre-feet of the groundwater pumped from the subwatershed each year is attributable to the fort’s presence. The fort estimates that only 2,560 acre-feet of water is pumped off-post each year to support military and civilian employees and their dependents, contractors and their dependents, and military retirees and their families. Additionally, the fort calculates that its presence has caused 1,228 additional people to live in the subwatershed and that these additional people consume approximately 206 acre-feet of water per year ($1,228 \times 150 \text{ gallons} \times 365 = 67,233,00 \text{ gallons}$, or 206 acre-feet). After adding these amounts to the baseline established in the biological opinion for on-post use each year (2,355 acre-feet), the fort concludes that it is responsible for 5,121 acre-feet of the groundwater pumped in the subwatershed each year ($2,560 + 206 + 2,355 = 5,121$). *Id.* at 115–16.

28. *Id.* The FWS applied the 1999 San Pedro Expert Study Team’s estimate that the total water pumped in the Sierra Vista subwatershed would be approximately 9,400 acre-feet in 2000.

29. *Id.* at 114.

30. *Id.* at 115–16.

31. Memorandum of Agreement between the U.S. Army and the U.S. Fish and Wildlife Service, Subject: Water Resources in the Sierra Vista Subwatershed of the Upper San Pedro River Basin (October 27, 1999) [hereinafter Memorandum of Agreement]. See 1999 BO, *supra* note 9, at Appendix 1.

32. Charter members of the Upper San Pedro Partnership (USPP) include: the Bureau of Land Management, Fort Huachuca, the U.S. Forest Service, the U.S. Geological Survey, the Arizona Department of Water Resources, the Arizona Department of Environmental Quality, the Arizona State Land Department, Cochise County, City of Sierra Vista, City of Bisbee, The Nature Conservancy, and the Town of Huachuca City. Memorandum of Understanding Establishing the Upper San Pedro Partnership (November 1998). See 1999 BO, *supra* note 9, at Appendix 1.

33. Memorandum of Agreement, *supra* note 31, at 1.

34. Army Water Resources Management Plan, Appendix A to the Memorandum of Agreement. See 1999 BO, *supra* note 9, at Appendix 1.

35. Army Requirements from Current Formal Consultation, Appendix B to the Memorandum of Agreement. See 1999 BO, *supra* note 9, at Appendix 1.

36. 1999 BO, *supra* note 9, at 91–96. The City of Sierra Vista began constructing an effluent recharge facility near the Upper San Pedro River in early 2001, which, when completed will recharge between 2,000 to 4,000 acre-feet annually to the aquifer. Rupkalvis, D. (2001, April 25). City slow from the starting blocks but gaining steam on water conservation campaign. *Sierra Vista Herald*, at A1.

37. Soon after the FWS issued its biological opinion, the Center for Biological Diversity,

a nonprofit environmental group, with other interested parties, filed suit in U.S. District Court for the District of Arizona (Civil No. 99-203 TUC-ACM). The suit alleged five causes of action: (1) the FWS's decision to issue the non-jeopardy biological opinion based on the Memorandum of Agreement was arbitrary and capricious; (2) the FWS's decision to limit its review of impacts to a ten-year period is arbitrary and capricious and violates the ESA; (3) the FWS's reliance on the Sierra Vista recharge project to delay impacts to the San Pedro River is arbitrary and capricious; (4) the FWS's decision is illegal because there is no rational connection between its analysis of the impacts of growth and its no-jeopardy conclusion; and (5) because the biological opinion is arbitrary and capricious, the Army is violating its duty to avoid jeopardy. See Plaintiff's brief in support of their motion for summary judgment (on file with the author). On April 8, 2002, Senior Judge Alfredo C. Marquez, U.S. District Court for the District of Arizona, issued an order ruling in favor of the plaintiffs (Center for Biological Diversity, et al.) on their first cause of action. The judge ruled that the 1999 biological opinion was arbitrary, capricious, and not in accordance with law because it lacked specific, enforceable mitigation measures that, based on the best scientific evidence available, are necessary to avoid jeopardizing listed species or adversely modifying their critical habitat. Center for Biological Diversity, et al., v. Donald H. Rumsfeld, No. CIV99-203 TUC ACM, 2002 U.S. Dist. LEXIS 7419 (Ariz. Apr. 8, 2002). Consequently, Fort Huachuca is consulting with the FWS to produce a new biological opinion with specific, enforceable mitigation measures. These measures will certainly include water conservation easements.

38. Water conservation technology includes low-flow showerheads, horizontal-axis washing machines, and waterless urinals. Conservation methods include strict restrictions on irrigation on post, replacing lawns with xeriscaping, leak-detection surveys of both water and sewer lines, and preaching a "water-wise" mentality.

39. These figures are based upon estimates prepared by the Fort Huachuca Directorate of Installation Support.

40. Upper San Pedro Partnership, Semi-Annual Report 3-4 (April 12, 2000).

41. The Nature Conservancy is a nongovernmental, nonprofit environmental organization with the primary mission to preserve biodiversity by identifying and protecting rare species and their fragile ecosystems. The Nature Conservancy possesses a unique expertise to negotiate acquisitions of private lands for conservation purposes. See Cooperative Agreement, Statement of Work at page 1.

42. Letter from Mr. David L. Harlow, Field Supervisor, U.S. Fish and Wildlife Service, to Colonel Michael W. Boardman, Commander, U.S. Army Garrison, Fort Huachuca (March 20, 2000).

43. *Id.*

44. *Id.* See also Cooperative Agreement between the U.S. Department of the Army, Fort Huachuca and The Nature Conservancy, Arizona Chapter, Statement of Work (September 27, 2000) [hereinafter Cooperative Agreement], at 2.

45. *Id.* at 2.

46. *Id.*

47. The U.S. Army Medical Research Acquisition Activity, located at Fort Detrick, Maryland, has authority to administer cooperative agreements under 31 USC § 6305. The U.S. Army Medical Research Acquisition Activity has unique experience administering these types of agreements. In addition to this agreement between Fort Huachuca and The Nature Conservancy, the U.S. Army Medical Research Acquisition Activity administers a similar agreement for Fort Bragg in North Carolina. See Cooperative Agreement between U.S. Department of the Army, Fort Bragg, U.S. Army Environmental Center, and The Nature Conservancy (September 1995) (on file with the author).

48. Fort Huachuca entered into this agreement pursuant to the Sikes Act, codified at 16 USC § 670. Under this authority, "[t]he Secretary of Defense may enter into cooperative agreements with States, local governments, nongovernmental organizations, and individuals to provide for the maintenance and improvement of natural resources on, or

to benefit natural and historic research on, Department of Defense installations.” 16 USC § 670c-1. Additionally, the Secretary of Defense may contribute matching funds to carry out programs under these agreements. 16 USC § 670c-1(b). An overarching cooperative agreement between the Department of Defense (DOD) and The Nature Conservancy establishes the procedures for planning and conducting cooperative efforts between the DOD and The Nature Conservancy on DOD lands. Cooperative Agreement between the Department of Defense and The Nature Conservancy (December 13, 1988). Under this agreement, installation commanders can obtain technical assistance from The Nature Conservancy and allow The Nature Conservancy to study significant ecosystems under the Army’s control. See also Army Regulation 200-3, Natural Resources—Land, Forest and Wildlife Management (February, 28 1995), at paragraph 2-8d. Consequently, installation commanders may enter into cooperative agreements with The Nature Conservancy and fund those agreements if the agreements benefit natural resources on their installations. Though the cooperative agreement between Fort Huachuca and The Nature Conservancy provides for The Nature Conservancy to acquire conservation easements to lands off of the installation, the easements will benefit threatened and endangered species that reside on the installation, namely the Southwestern willow flycatcher and the Huachuca water umbel, as well as other species who would benefit from the continuing flow of the Upper San Pedro River. Furthermore, Fort Huachuca has entered into this cooperative agreement to fulfill its statutory mandate under Section 7(a)(1) of the Endangered Species Act to “utilize [its] authorities in furtherance of the purpose of this chapter by carrying out programs for the conservation of endangered species and threatened species . . .” 16 USC § 1536(a)(1).

49. Cooperative Agreement, *supra* note 44, at 2.

50. *Id.* at 2.

51. *Id.* at 5.

52. Programmatic Environmental Assessment: Purchase, Transfer and Management of Conservation Easements in the Southern Upper San Pedro Basin in Arizona, August 22, 2001, at page 5.

53. Cooperative Agreement, *supra* note 44, at 4.

54. *Id.* at 4.

55. *Id.* at 4.

56. Under the Arizona Uniform Conservation Easement Act, the U.S. Bureau of Land management may hold and enforce conservation easements in Arizona because it is “[a] government body empowered to hold an interest in real property under the laws of this state or the United States.” ARS § 33-271, para 3(a).

57. Letter from Mr. David L. Harlow, Field Supervisor, U.S. Fish and Wildlife Service, to Colonel Michael W. Boardman, Commander, U.S. Army Garrison, Fort Huachuca (March 20, 2000).

58. *Id.*

59. *Id.*

60. *Id.*

61. This number is a product of subtracting the 1,138 acre-feet of credit from the 3,455 acre-feet annual off-post consumption that the FWS attributes to the fort in the 1999 biological opinion. Applying its own figure of 2,766 acre-feet, the fort believes that it will soon reduce its outstanding liability for the off-post water-pumping deficit to 1,628 acre-feet. See *supra* notes 27–30 and accompanying text.

62. Or 628 acre-feet, according to the fort’s calculations. See *supra* notes 27–30 and 60 and accompanying text.

63. See *supra* note 20 and accompanying text.