CCRN

Cochise Conservation & Recharge Network

ANNUAL REPORT 2023

How We Work

In 1988, Congress designated the San Pedro Riparian National Conservation Area (SPRNCA)—the first of its kind—to protect its unique desert riparian ecosystem. Starting at the international border with Mexico and spanning 43 miles along the river in Cochise County, Arizona, the SPRNCA is managed by the U.S. Bureau of Land Management. The local groundwater that sustains the riparian area and the San Pedro River is also used by the U.S. Army Fort Huachuca, City of Sierra Vista, and neighboring communities.

Since 2015, CCRN has supported its mission and goals by developing and implementing projects that protect groundwater resources in strategic locations along the river. The network currently includes 7 sites, including water conservation and protection projects and groundwater recharge facilities. An eighth project is planned in the coming year.

2020 – 2024 CCRN Roadmap

Mission

To implement a regional network of land and water management projects that result in a healthy watershed, flowing San Pedro River, conservation of water resources, and a vibrant local economy.

Goals

1. **Groundwater Recharge**
   Design/construct the Coyote Wash Stormwater Management, Riverstone Effluent, and Bisbee Effluent Recharge Projects

   Continue the operation, maintenance, and hydrologic monitoring of all existing network sites

2. **Water Conservation**
   Implement conservation and watershed health projects

   Continue to use groundwater modeling and other tools to evaluate the overall effectiveness of all projects

Implementing Land and Water Management Projects for the San Pedro

CCRN also maintains a long-term monitoring network and supports hydrologic modeling and engineering studies to plan and verify the network's effectiveness.

Collaborative Partnerships

The following partnerships also engage dozens of local, state, and federal agencies, other organizations, and hundreds of volunteers to develop collaborative science, planning tools, and resources that support CCRN in their projects to conserve land and water near the Upper San Pedro River.

The Upper San Pedro Partnership, established in 1998, laid the foundation for science-based decision making through hydrologic research and building strong hydrologic monitoring and modeling tools. uppersanpedropartnership.com

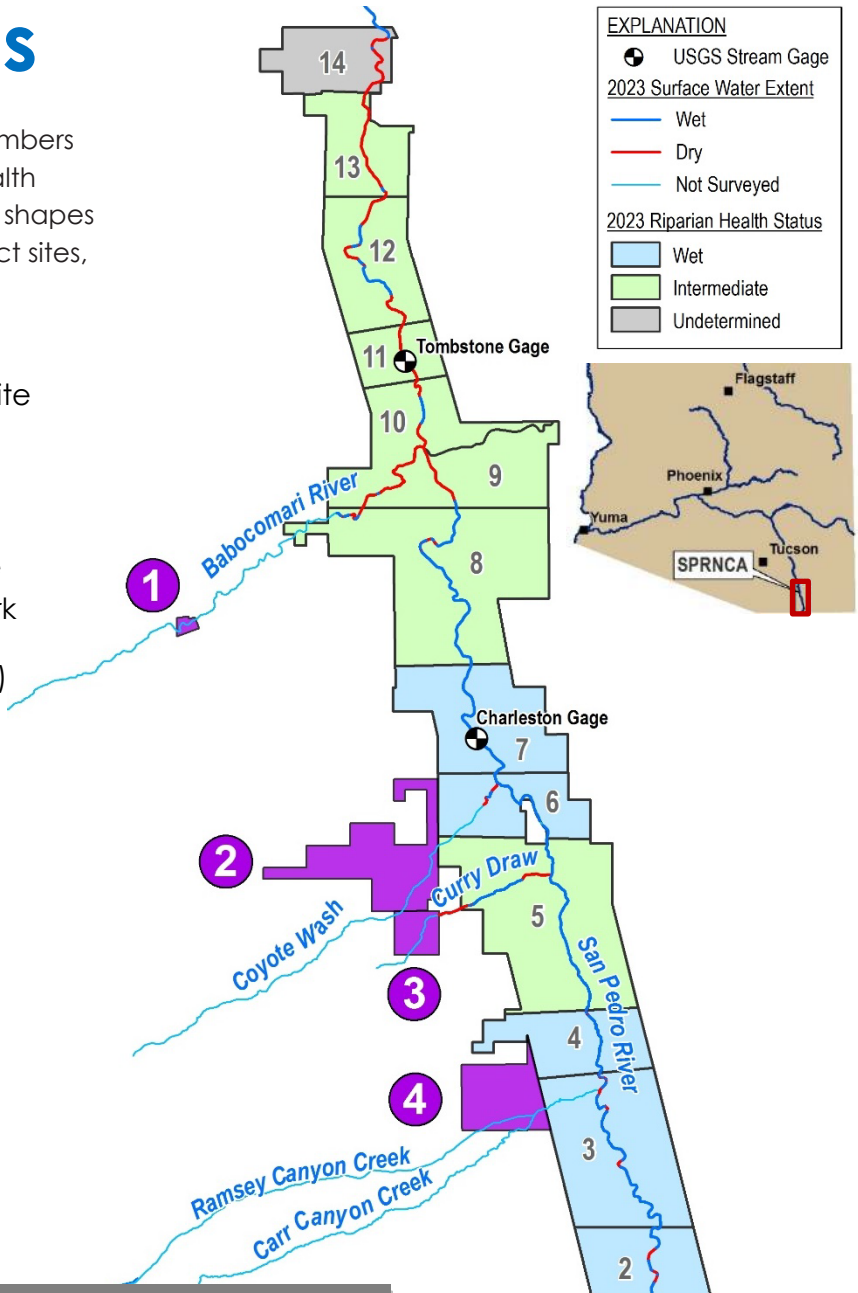
The Fort Huachuca Sentinel Landscape, designated in 2015, covers approximately 2.9 million acres of southeastern Arizona, including the SPRNCA. The collaborative efforts of this partnership aim to strengthen military readiness, conserve natural resources and habitat, bolster agricultural economies, increase public access to outdoor recreation, and enhance resilience to climate change across the larger landscape.

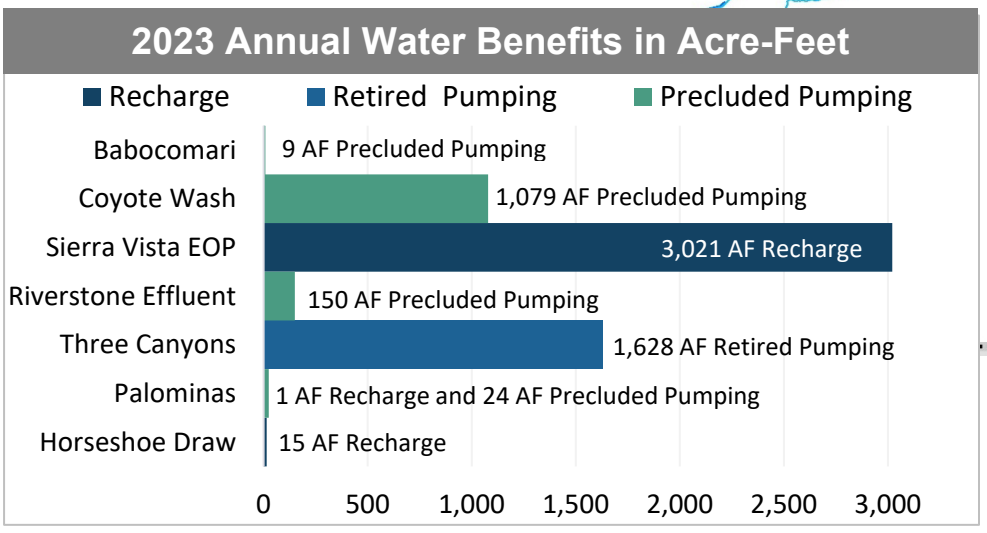
The SPRNCA MOU for Cooperative Monitoring and Management, signed in 2021 by the U.S. Bureau of Land Management, Department of Defense/Fort Huachuca, Cochise County, and City of Sierra Vista, establishes a robust monitoring and adaptive management framework to ensure land and water management projects along the Upper San Pedro are sufficient to meet local water needs and the purpose of the SPRNCA.

Our Project Sites

This map shows the extent of the SPRNCA. Numbers 1-14 on the map correspond with riparian health assessment reaches. The purple numbers and shapes alongside the map represent the CCRN project sites, current and future.

1. Babocomari Floodplain Protection Site
2. Coyote Wash Stormwater Management Project (in design)
3. City of Sierra Vista Effluent Recharge at the Environmental Operations Park
4. Riverstone Effluent Project (in design)
5. Three Canyons Conservation Site
6. Palominas Stormwater Recharge and Flood Control Project
7. Horseshoe Draw Sediment Control and Stormwater Recharge Project
8. Bisbee Effluent Project (in design)





What We Accomplished in 2023

Projects

- Total 2023 project water benefits of 5,925 acre-feet (AF) including recharge, retired pumping, and precluded pumping
- Initiated Bisbee Effluent Recharge Project Pipeline design concept report
- Completed Riverstone Effluent Recharge Project Phase 2 site investigation
- Initiated final design and construction plans and National Environmental Permitting Act (NEPA) process for Coyote Wash Stormwater Recharge Project
- Continued development of an integrated groundwater and surface water model for use in the design and development of CCRN projects

Funding

- Secured Readiness and Environmental Protection Integration (REPI) Challenge 2023 funding of $1,000,000 for Riverstone Effluent Recharge Project design and permitting
- Secured America the Beautiful funding of $515,000 for Bisbee Effluent Recharge Project design and permitting

Outreach

Through tours and presentations, we shared our project knowledge and accomplishments with the following organizations: White House Council on Environmental Quality, Foundation for America's Public Lands, Department of the Interior, Department of Defense Sentinel Landscapes, Cochise County Master Naturalists, Arizona Tri-university Recharge and Water Reliability Project, Department of Defense Climate Workshop in St. Louis, Cochise County Workshop on Climate and Recharge, and Quantified Ventures.

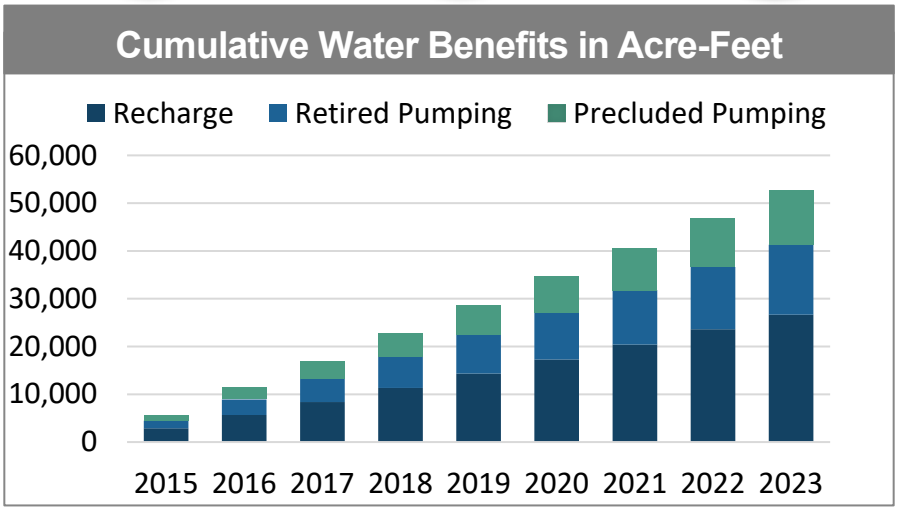
CCRN IMPACT

Since 2015, CCRN projects have provided a total of 52,625 AF of water benefits to the local aquifer in 3 ways: 1)direct recharge of treated effluent and stormwater runoff, 2)permanent retirement of large-volume pumping through conservation easements, and 3) precluding future pumping through conservation easements on land slated for development.

Precluded Pumping **11,320 AF**

Recharge **26,652 AF**

Retired Pumping **14,652 AF**



What We're Learning From Our Projects

Sufficient Source Water for Managed Recharge

The design of a regional network of managed aquifer recharge projects is often constrained by sufficient sources of water for recharge. The combination of effluent and stormwater is needed to sustain the flows of the San Pedro according to predictive hydrological models. High-quality treated effluent is a consistent and dependable source of water for recharge as demonstrated at the **City of Sierra Vista Environmental Operations Park**. However, the combined use of effluent with increased runoff from urbanized areas and watersheds experiencing accelerated runoff can provide a portfolio of water resources for recharge that meets regional water management objectives.

Impacts of Drought

Precipitation and resulting runoff are highly variable among the CCRN sites, seasons, and years. Monitoring data indicates 2023 was the driest monsoon season since the establishment of CCRN, and less rainfall, rising temperatures, and increasingly drier soils all contribute to the reduction of stormwater runoff that is available for recharge. When it does rain, stormwater recharge facilities need to be as effective as possible in enhancing the infiltration of runoff for recharge and minimizing evaporation.

	2023 Precipitation		
	Annual	**Monsoon**	**Non-Monsoon**
Horseshoe Draw	Average	Average	Average
Palominas	Average	Dry	Average
Riverstone	Dry	Dry	Average
Coyote Wash	Dry	Dry	Average

The Race Against Evaporation

In the San Pedro watershed, an estimated 98% of rainwater evaporates, approximately 1% becomes stormwater runoff that flows to stream channels, and approximately 1% naturally infiltrates, recharging the groundwater aquifer. When stormwater infiltrates quickly into the soil, evaporative loss is minimized, resulting in more recharge to the aquifer. Recharge enhancement structures such as those at the **Palominas Stormwater Recharge and Flood Control Site** can increase infiltration rates and reduce evaporation. However, opportunities to enhance the infiltration rates of natural drainages may be even more effective than those at constructed recharge facilities.

Nature-based Solutions: Flow Restoration

Detention basins that capture excess runoff from urban areas while still allowing for natural flood flows can be managed to slowly release flows to ephemeral channels, restoring a flow regime closer to that which occurred before development. As demonstrated at the **Horseshoe Draw Sediment Control and Stormwater Recharge Project**, this results in significantly more infiltration in the natural channel downstream. Stormwater recharge projects designed to restore flows within natural channels maximize their recharge functions and are a low maintenance, efficient, and cost-effective way to increase infiltration and subsequent recharge.

Nature-based Solutions: Floodplain Recharge

Flood flows are essential to sustain healthy riparian ecosystems and for groundwater recharge. For months after large floods, groundwater storage is increased near floodplains, benefiting riparian health and allowing for the slow release of groundwater back to rivers, helping to sustain flows in hot, dry summers. As demonstrated at the **Babocomari Floodplain Protection Site**, naturally functioning floodplains that remain undeveloped are a cost-effective, nature-based solution for maintaining groundwater storage.

Babocomari Floodplain Protection Site

The Babocomari Floodplain Protection site is located just downstream of Huachuca City on the largest tributary to the Upper San Pedro River. The site consists of 3 parcels on nearly 600 acres with conservation easements as well as a County-owned parcel that was previously slated for development. Collectively, the parcels protect the Babocomari River and floodplain, as well as buffer the north border of Fort Huachuca's East Range from additional development.

While no recharge infrastructure project is currently planned at the site, initial studies suggest a future project at this location may raise groundwater levels and increase flows of the Babocomari River, connecting sections of the river that do not flow year-round. Groundwater levels increase dramatically at the site during monsoon season flood events, as shown in the hydrograph below, and the water table remains higher several months later. This illustrates the importance of flood flows, which are not only essential ecologically, but also have a direct beneficial influence on groundwater storage for months after they occur.

PROJECT AT A GLANCE

Owner: Cochise County

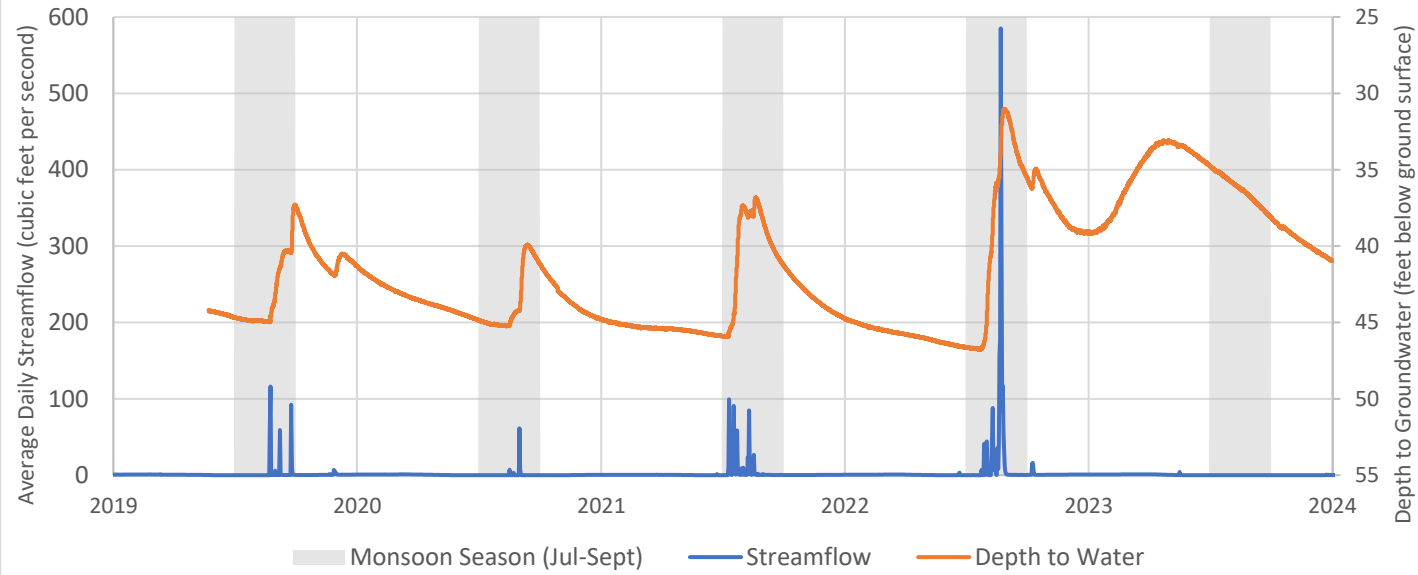
Partner: TNC holds conservation easement

Project Type: Precludes future pumping

Status: Acquired in 2018

Water Benefits: 9 AF of precluded pumping in 2023 and 52 AF since 2018

Streamflow and Depth to Groundwater



Coyote Wash Stormwater Management Project (in design)

The 2,984-acre Bella Vista Ranch parcel is permanently protected from future development and the associated groundwater pumping. The open space associated with these lands provides an essential buffer between Sierra Vista, Fort Huachuca, and the SPRNCA and contains the largest tributary that flows from the urban core of the City to the San Pedro River. Urbanized areas upstream produce additional stormwater runoff from streets, parking lots, and rooftops because these surfaces reduce the ability of rainfall to infiltrate into the ground. The graph below is a conceptual comparison of pre- and post-development runoff.

The future Coyote Wash Stormwater Management Project will capture some of this additional urban enhanced runoff to recharge the underground aquifer. The recharge project is being designed to retain a portion of this flow while also allowing natural runoff to continue downstream. The goal of the project is to raise groundwater levels in a critical area that supports river baseflows and protects the river from municipal groundwater pumping centers. By reducing runoff and erosion, the project will reduce E. coli, other contaminants, and sedimentation downstream, improving the water quality in the San Pedro River.

PROJECT AT A GLANCE

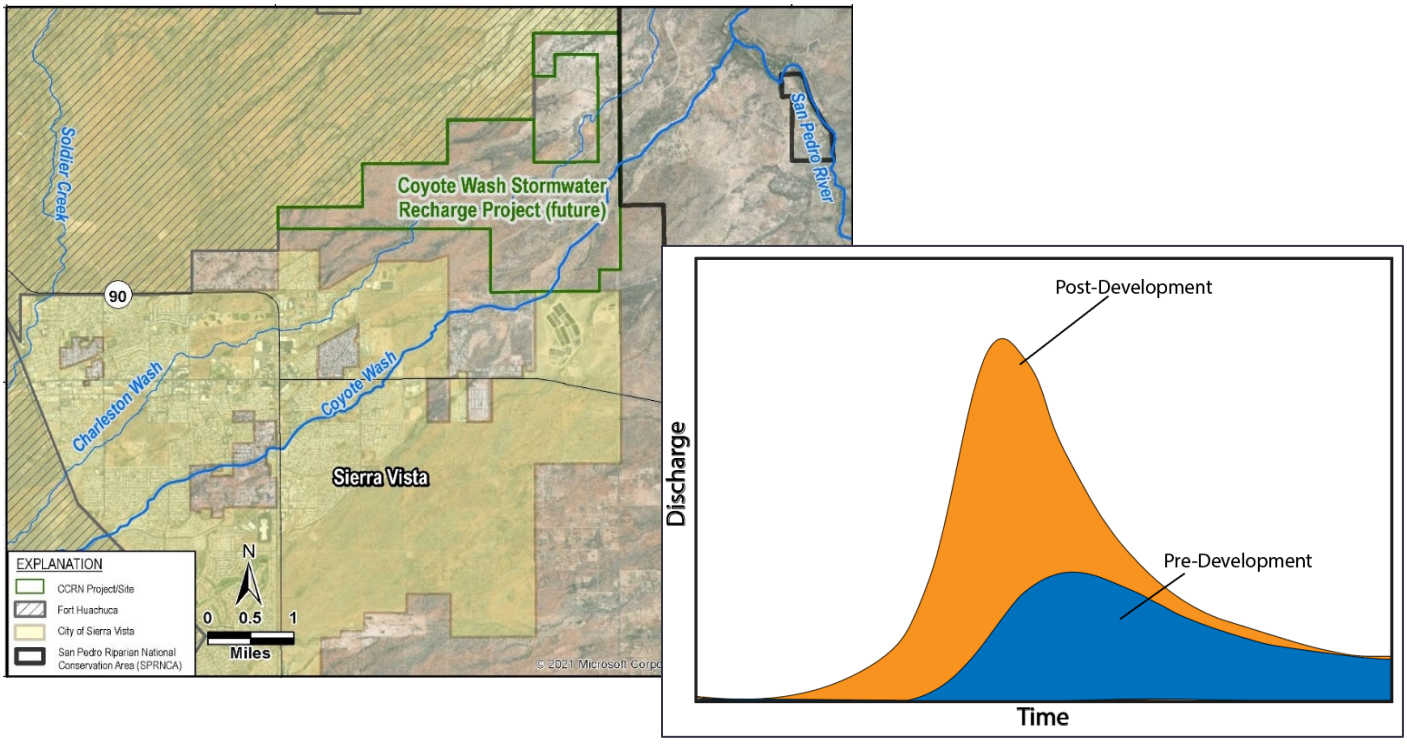
Owner: Cochise County

Partners: TNC holds conservation easement

Project Type: Precludes future pumping; future stormwater management and recharge

Status: Acquired in 2013. Final engineering and design expected to be completed in 2024.

Water Benefits: 1,079 AF of precluded pumping in 2023 and 9,710 AF since 2015



City of Sierra Vista Effluent Recharge at the Environmental Operations Park

The City of Sierra Vista Effluent Recharge Project at the 640-acre Environmental Operations Park (EOP) is located on Highway 90 on the west side of the San Pedro River and is the largest recharge facility within CCRN. The project recharges the city's Class A quality treated effluent in 11 recharge basins and adjacent wetlands. Recharge in the area is raising groundwater levels in a critical area that supports San Pedro River flows by protecting the river from the main municipal groundwater pumping center. Ongoing monitoring indicates that the recharge benefits extend for considerable distances from the project and provide the proof of concept for subsequent recharge projects by CCRN.

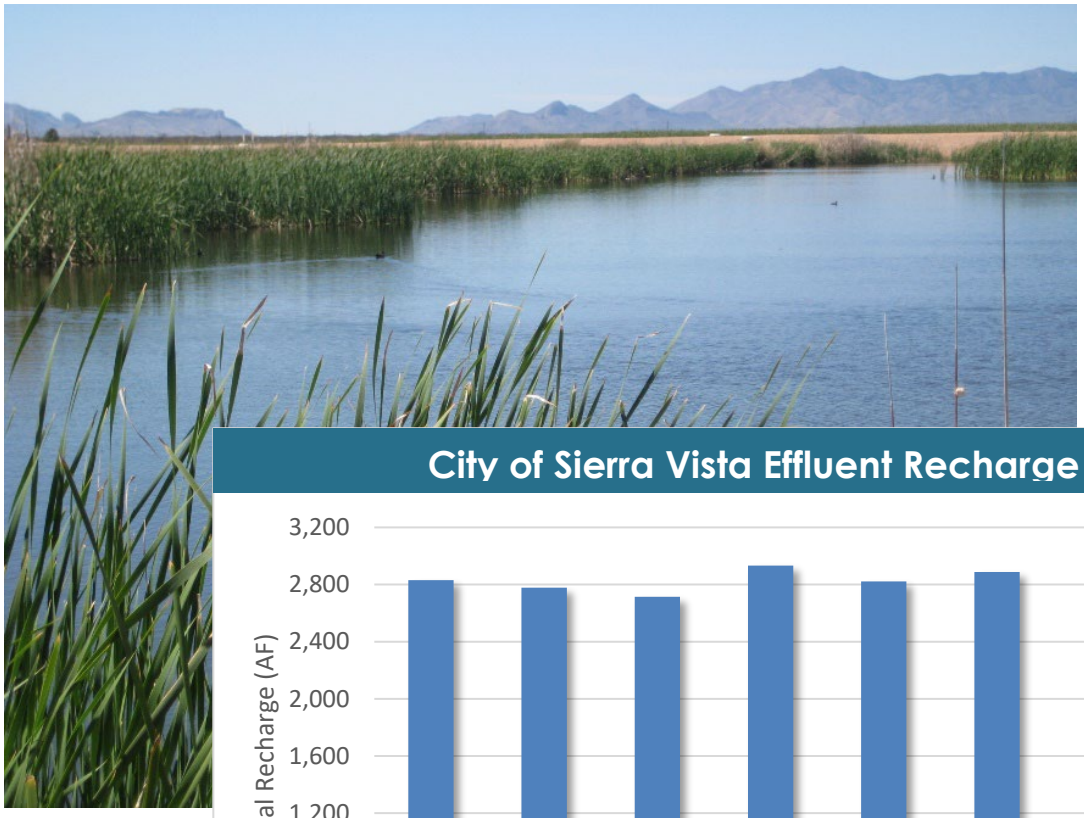
PROJECT AT A GLANCE

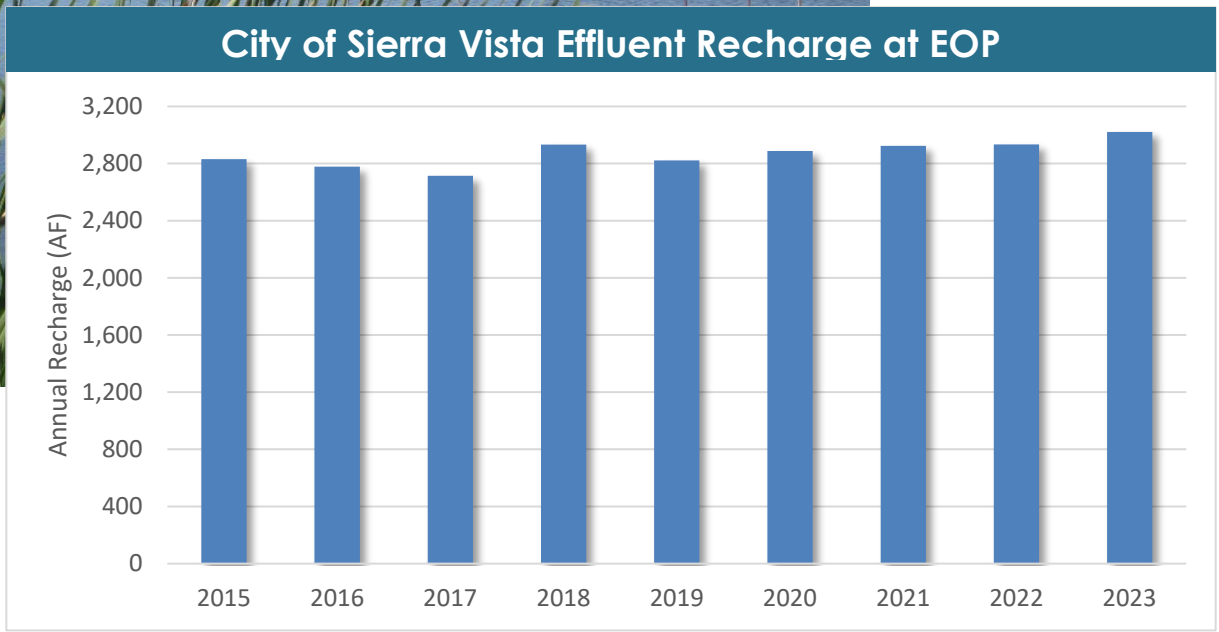
Owner: City of Sierra Vista

Project Type: Effluent recharge

Status: In operation since 2002

Water Benefits: 3,021 AF of recharge in 2023 and 25,845 AF since 2015





Riverstone Effluent Project (in design)

The future Riverstone Effluent Project is adjacent to the SPRNCA on the west side of the San Pedro River on a 1,811-acre parcel. Nearly 2 decades of wet-dry mapping show that this location is at the start of the longest perennial reach of the river, presenting a unique opportunity to protect flows in a critical stretch of river. The conservation easement precludes future development and associated groundwater pumping, with an estimated benefit of approximately 150 AF/yr of precluded pumping. The site is downstream of both developed and undeveloped areas of the City of Sierra Vista and includes the ephemeral channels of Ramsey Canyon and Carr Canyon Creeks, portions of which are designated as critical habitat for the threatened western yellow-billed cuckoo. Effluent from the City of Sierra Vista will be used to replenish the aquifer and restore degraded critical habitat, raise near-stream groundwater levels, and increase downstream baseflow in the River.

PROJECT AT A GLANCE

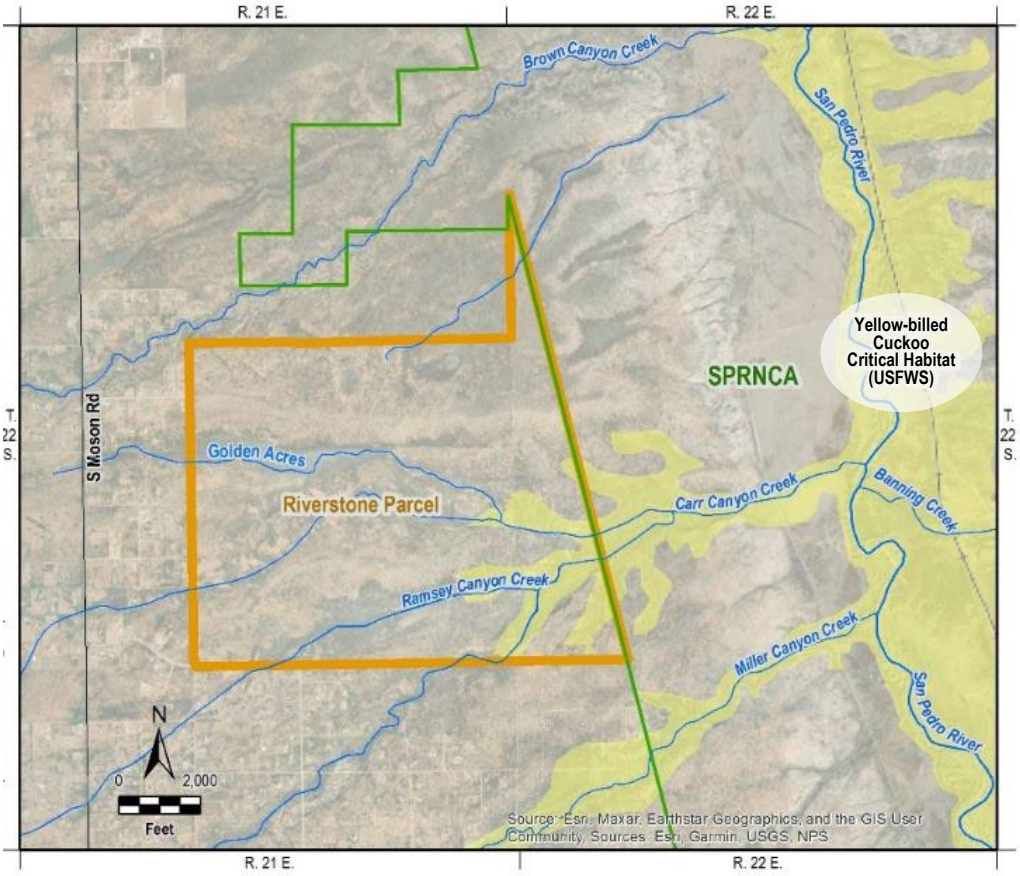
Owner: Cochise County

Partners: TNC holds conservation easement

Project Type: Precludes future pumping; Future effluent recharge

Status: Acquired in 2012. Initial project studies completed in 2014. Groundwater and surface water monitoring began in 2016. Additional recharge feasibility studies completed in 2023. Project design completed by 2025.

Water Benefits: 150 AF of precluded pumping in 2023 and 1,346 AF since 2015



Three Canyons Conservation Site

The Three Canyons Conservation Site was acquired to permanently limit future groundwater pumping and development. Historically, large capacity wells pumped water for irrigation on the property. This 480-acre site showcases the benefit of retiring high-volume pumping in strategic locations to the river and water levels in nearby residential wells.

The graph below shows the depth to groundwater from a well adjacent to the river west of the Three Canyons Conservation Site. After the significant pumping for irrigation on this site was permanently retired in 2005, the groundwater levels rebounded approximately 10 feet to pre-pumping water levels. All well owners in the area share the benefit when water levels rise.

PROJECT AT A GLANCE

Owner: Cochise County

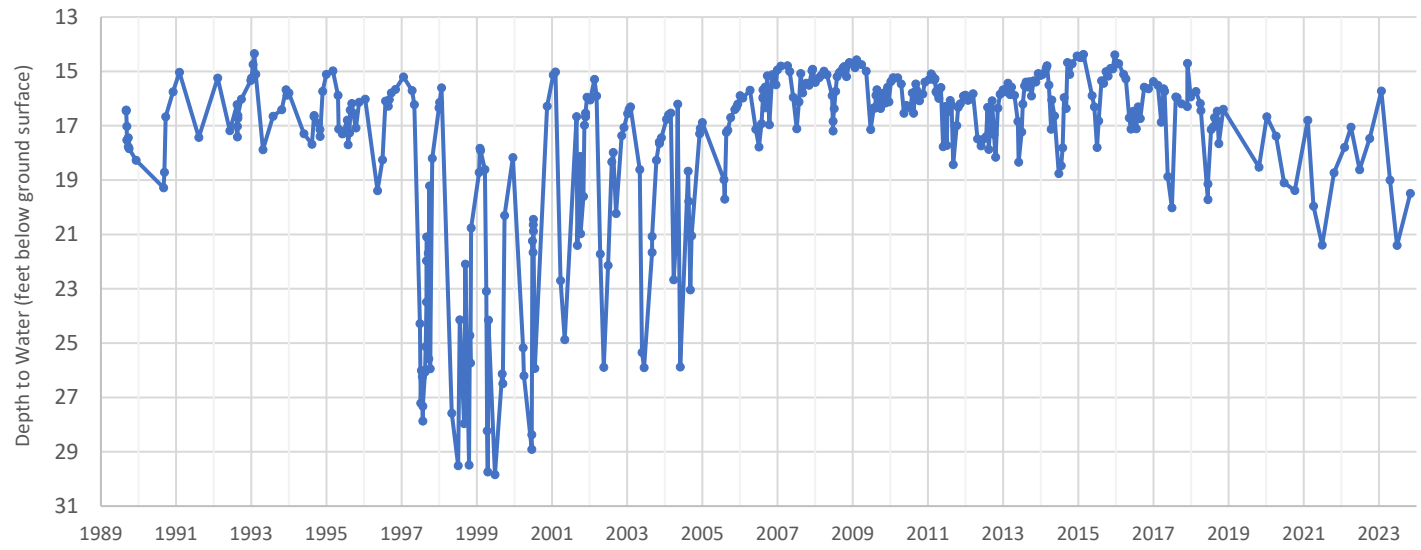
Partners: City of Sierra Vista holds conservation easement

Project Type: Retired high-volume irrigation pumping

Status: Acquired in 2013

Water Benefits: 1,628 AF of retired pumping in 2023 and 14,652 AF since 2015

Depth to Groundwater Near the San Pedro River West of the Three Canyons Conservation



Station ID: 312332110063801

Palominas Stormwater Recharge and Flood Control Project

The Palominas Flood Control and Stormwater Recharge Project is located along Palominas Road, just north of the Highway 92 intersection, on the west side of the San Pedro River. The 285-acre facility is designed to recharge up to 98 AF/year via its large detention basin and 13 recharge cells that together form a constructed channel. Natural sheet flow runoff from surrounding areas is conveyed to the channel, and the cells are designed to test and compare the effectiveness of various types of infiltration structures (basins, dry wells, and trenches) in terms of how much they enhance the recharge of stormwater into the ground. When stormwater infiltrates quickly into the soil, evaporative loss is minimized, resulting in more recharge to the aquifer.

Monitoring, as shown in the chart below, is tracking the effectiveness of different types of stormwater recharge structures. More data from larger storm events are needed to evaluate the relative performance of the different recharge enhancement features at this test site. Learning which types of structures are best suited for different types of sites through careful monitoring leads to improved project performance and cost savings for construction and maintenance over the long term.

PROJECT AT A GLANCE

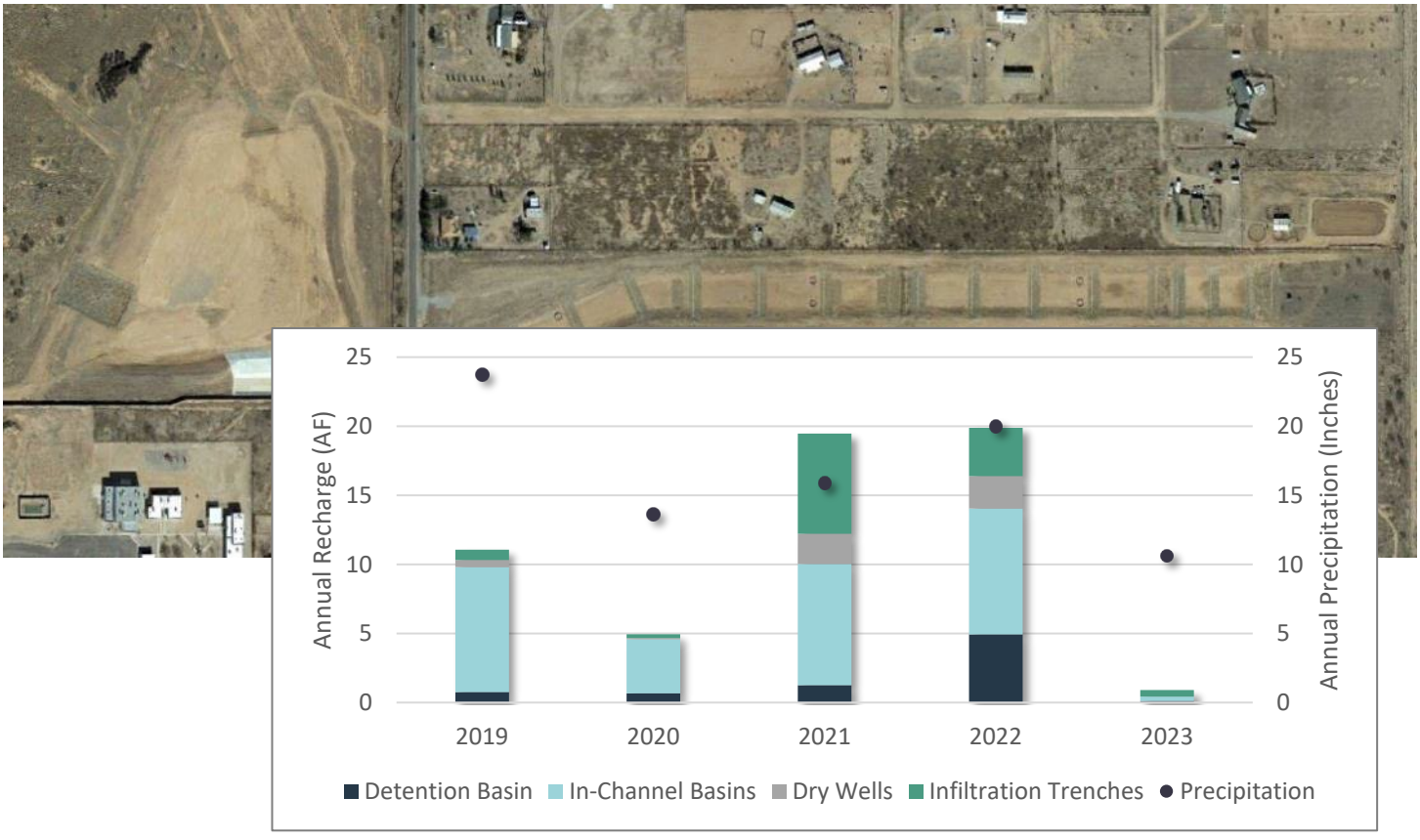
Owner: Cochise County

Partners: TNC holds conservation easement

Project Type: Stormwater (sheet flow) management and recharge

Status: Completed in 2014

Water Benefits: 25 AF of precluded pumping and recharge in 2023 and 344 AF since 2015



Horseshoe Draw Sediment Control and Stormwater Recharge Project

Horseshoe Draw is an ephemeral tributary to the Upper San Pedro River that originates in the San Jose Mountains in Mexico. Before the project was constructed, accelerated runoff had steadily been eroding Horseshoe Draw, forming a large head-cut in the channel. The 40-acre site includes an 8-acre detention basin within the natural channel.

The basin slowly releases runoff to the channel which allows for significantly more infiltration within the channel downstream of the basin than would occur otherwise. The project provides multiple benefits including enhanced aquifer recharge, erosion and flood reduction, and water quality improvement. As seen in the illustration below, years with the most precipitation result in much more channel recharge due to this facility than would have occurred without it. This facility may become increasingly beneficial as the intensification of storms increases in the future as part of a changing climate. However, during drier years the basin provides relatively little channel recharge benefit.

PROJECT AT A GLANCE

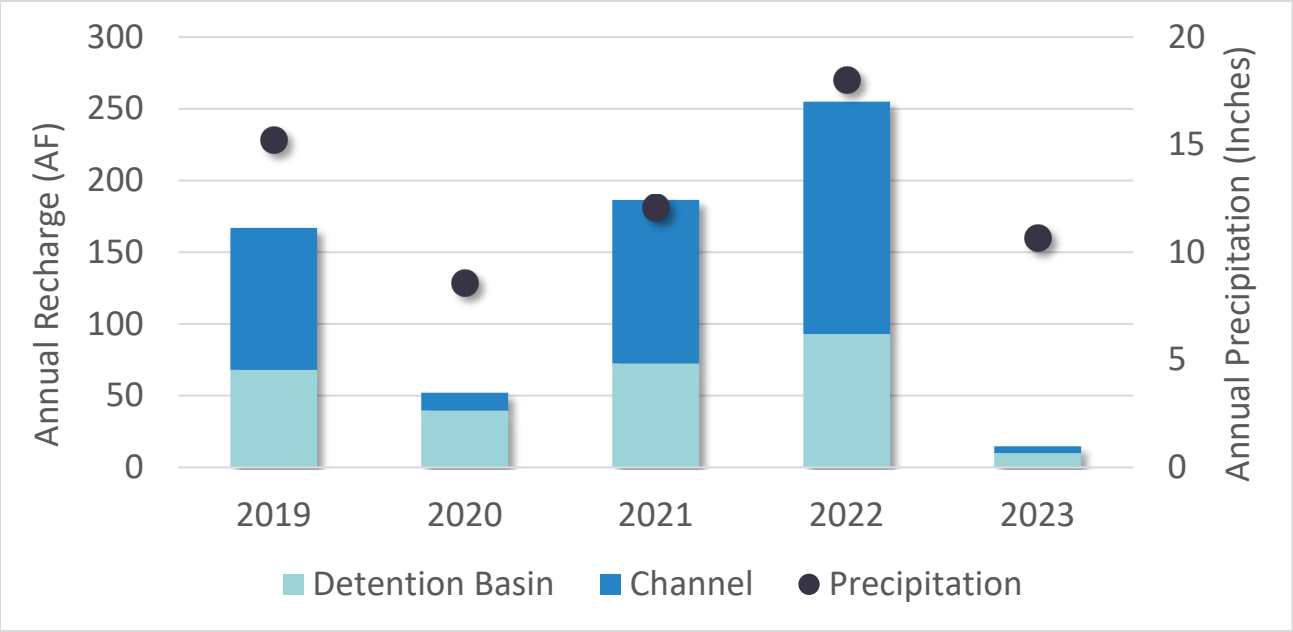
Owner: San Jose Ranch; Cochise County owns structure

Partners: San Jose Ranch; BLM holds conservation easement

Project Type: Recharge of accelerated runoff in a detention basin and ephemeral channel

Status: Project studies and planning conducted in 2015-2016. Design and construction completed in 2017.

Water Benefits: 15 AF of recharge in 2023 and 675 AF since 2019



Bisbee Effluent Recharge Project (future)

The Bisbee Effluent Recharge Project will be located between the international border and Highway 92 in Palominas at a near-stream location west of the San Pedro River. In this area, the length of wetted stream reach has declined most significantly in the SPRNCA, according to over 20 years of monitoring. The facility will be designed to recharge a minimum of 200 acre-feet and a maximum of 600 acre-feet per year of effluent transported via a 13-mile pipeline from the City of Bisbee's San Jose Wastewater Treatment Plant.

CCRN partners are working on establishing the right-of-way for the pipeline in cooperation with federal agencies along the international border. Future work includes finalizing an effluent lease agreement, design and construction of the pipeline route, land acquisition, and hydrogeologic investigations and groundwater modeling to quantify benefits to the river.

PROJECT AT A GLANCE

Owner: Cochise County (proposed)

Partners: City of Bisbee

Project Type: Effluent recharge

Status: Ongoing planning design and deliberation with partners

Water Benefits: to be determined

CCRN Cochise Conservation & Recharge Network

MEMBERS

Following each member agency is the year they joined CCRN.

City of Sierra Vista, Founding Member, 2015
Charles Potucek, *City Manager, CCRN Chair*
Victoria Yarbrough, *Assistant City Manager, Alternate CCRN Representative*
Sharon Flissar, *Public Works Director, CCRN Technical Representative*

County of Cochise, Founding Member, 2015
Joe Casey, *Associate County Administrator & Chief Information Office, CCRN Representative*
Jackie Watkins, *Director, Engineering & Natural Resources, CCRN Technical Representative*
Mark Apel, *Environmental Projects Coordinator, CCRN Technical Representative*

Hereford Natural Resource Conservation District, Founding Member, 2015
John Ladd, *NRCD Chair, CCRN Representative*
Pat Call, *NRCD Vice Chair, CCRN Representative*

The Nature Conservancy, Founding Member, 2015
Kim Schonek, Arizona *Water Program Director, CCRN Representative*
Bailey Winston, *Southern Arizona Water Projects Manager, CCRN Technical Representative*

City of Bisbee, 2016
Steve Pauken, *City Manager, CCRN Vice Chair*
Matthew Gurney, *Public Works Director, CCRN Technical Representative*

Fort Huachuca, 2021
Col. John M. Ives, *Garrison Commander, CCRN Representative*
David Tiedemann, *Deputy to the Garrison Commander, CCRN Representative*
Holly Ballantyne, *Hydrologist, CCRN Technical Representative*

U.S. Bureau of Land Management, 2022
Scott Feldhausen, *Gila District Manager, CCRN Representative*
Alexia Williams, *Gila District Office Project Manager, CCRN Technical Representative*

Consultants
Juliet McKenna, Mekha Pereira, Caryn Fogel, *Montgomery & Associates*
Holly Richter, *Resilient Rivers, SPRNCA MOU Coordinator*

CCRNSanPedro.org
June 2024

Photo credit: Back cover–*Alexia Williams, Bureau of Land Management*