Fall 2024 Bi-National Beaver Survey of the San Pedro River: Survey Methods & Results

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Watershed Management Group

Nadira Mitchell, Restoration Ecology Apprentice
Brenai Smith Shires, Restoration Ecology Apprentice
Catlow Shipek, Sr. Program Director
Data collected by: Community Scientist Volunteers, Watershed Management Group, Profauna, Mike Foster, Steve Merkley, Sky Island Alliance, CONANP, the National Park Service and others

Fall 2024 Executive Summary

Beavers were once a keystone species in the rivers of southeastern Arizona but were extirpated by trapping over 100 years ago. In an effort to revive the species locally and to regain the ecosystem services provided by beaver, the Arizona Game and Fish Department (AZGFD), in partnership with Bureau of Land Management (BLM), reintroduced beaver to the San Pedro River. Building on previous monitoring efforts, Watershed Management Group (WMG) and partners launched an annual bi-national beaver survey along the San Pedro River in 2021. Through a community-science collaboration, WMG and partners collected evidence of beaver presence in the watershed, including dams, tracks, and beaver chews.

In Fall 2024, WMG conducted the fourth and most recent annual bi-national beaver survey on the San Pedro River. This was the first year we surveyed river reaches in the Middle and Lower San Pedro River. Based on survey responses along the river reaches that were surveyed, we estimate that there are approximately 30-38 beavers present on the San Pedro River. Of the total, we estimate that there are approximately 13-17 beavers, including three family groups present in the reaches surveyed in Sonora. Within Arizona, we estimated 17-21 beavers, including 3-4 families. The San Pedro Riparian National Conservation Area (SPRNCA), managed by the BLM, had an estimated 9 beavers, including one family, while the middle and lower San Pedro had 8-12 beavers with 2-3 family groups. These results highlight a continued trend of a decreasing beaver population along the San Pedro River.

Introduction

Historically, beavers played a key role in maintaining watershed health for the Santa Cruz and San Pedro Rivers and were once considered a keystone species in these watersheds. However, they were extirpated from the local watersheds by over-trapping in the 1800s. Beavers were reintroduced to the San Pedro Riparian National Conservation Area (SPRNCA) in 1999 and 2000 with Arizona Game and Fish Department (AZGFD) leading beaver translocation and initial monitoring efforts. The Bureau of Land Management (BLM) later continued monitoring for several years. The beaver population initially grew to over 100 individuals by 2010, but has since sharply declined. The loss of this “ecosystem engineer” species threatens the health of these rivers, especially in the face of the ongoing Southwest megadrought. To reverse the decline of beavers and protect their vital role in rehydrating our watersheds, a better understanding of local beaver activity is needed.

In 2015, Mike Foster, a local resident, and Steve Merkley from Cochise College began informal surveys to continue monitoring the health of the beaver population. In 2020, Watershed Management Group (WMG) partnered with Foster and Merkley to support community-science driven survey efforts in the SPRNCA, building on Foster’s experience with previous BLM surveys. In 2021, WMG expanded and formalized this effort by implementing a beaver survey data collection application (Survey123), developing standardized methodologies and protocols, and establishing partnerships to coordinate survey efforts between Arizona and Sonora, Mexico.

The goal of the bi-national survey is to better understand the population size and distribution of beaver along the San Pedro River and to track changes in population and movement over time. Survey results provide valuable information to inform management and restoration of habitat in the SPRNCA and can inform efforts to support beaver reintroduction in other areas of southern Arizona. Additionally, the survey helps WMG and its partners better understand and forecast beaver reintroduction dynamics in southern Arizona.

The Bi-National Beaver Survey is part of WMG’s “Release the Beavers” campaign, which aims to advocate for beaver reintroduction, monitor the health and distribution of beaver populations, and restore creeks and rivers by utilizing beavers to slow flows, spread water across floodplains, and recharge aquifers. Re-establishing beaver populations is a proven, cost-effective strategy to enhance groundwater recharge and improve habitat for native wildlife species. As a keystone species, beavers create conditions that restore surface flows, mitigate flood impacts, and increase ponding. This benefits the habitats of a number of other native species, including bird species that support Arizona’s recreation economy (Johnson and Van Riper, 2014). Through education, community science and advocacy, beavers can return to southern Arizona’s creeks and rivers.

Methods

These survey methods are based on community science models and informed by a comprehensive literature review of similar studies, as well as consultations with local experts. All volunteers were required to attend or view the recording of a virtual training, which outlined the

purpose of the beaver surveys, survey procedures, necessary gear, and what to expect during the survey.

During the surveys, volunteers and staff traversed riverbanks while documenting evidence of beaver activity, including tracks, tree chews, dams and lodges. Volunteers were organized into groups of four to eight, each led by at least one WMG staff member, intern, or representative from a partner organization. Observations were recorded using the ESRI ArcGIS Survey123 app for data collection. The volunteers also gathered information about trees within a 50-foot radius of the identified activity, focusing on riparian species such as willow, cottonwood, ash, sycamore, jarilla, and hackberry. Volunteers were also asked to assess river flow levels and provide photo evidence. A section was included for additional notes, and photo evidence was required to showcase the identified activity. The beaver survey questionnaire included an option to document cattle activity, such as tracks, dung, or the presence of cattle along the river. All cattle observations are recorded and reported to the BLM for the SPRNCA river reaches. For detailed methodology please refer to prior annual survey reports found online.

Fall 2024 Survey

In Fall 2024, the survey was extended downstream of the SPRNCA along the San Pedro River (see Figure 1). A total of 77.5 river miles of the San Pedro River were surveyed from the headwaters in Sonora Mexico, to the lower San Pedro downstream of Mammoth, Arizona. WMG designated 29 reaches in total to survey: eight reaches in Sonora totaling 21 miles, 14 reaches in the Upper San Pedro River, also known as the San Pedro Riparian National Conservation Area (SPRNCA) totaling 41 miles, and seven new reaches in the middle and lower San Pedro totaling 15.5 miles.

Within the SPRNCA, one survey was completed on October 26th, seven surveys on November 16th, and four surveys on December 7th. Additionally, Mike Foster completed the first reach, covering 4.2 miles from the U.S.–Mexico border to Arizona State Route 92 (SR 92). On November 26th, surveys were completed in Mexico along the San Pedro River and a tributary just south of the U.S.–Mexico border. In total, 120 volunteers, including WMG staff, participated in the Fall 2024 survey efforts.

Data Analysis Methods

To analyze the Fall 2024 results in ArcGIS Online, each entry indicating recent signs of beaver activity such as chews, dams, lodges, slides, food caches, tracks and scat was reviewed and confirmed by WMG to verify whether the sign was indeed recent.

In the map viewer, unique symbols were assigned to each activity sign type: chews, dams, lodges, slides, food caches, tracks, and scat. These unique symbols helped to distinguish between observation signs to identify family groups from those of individual roaming beavers.

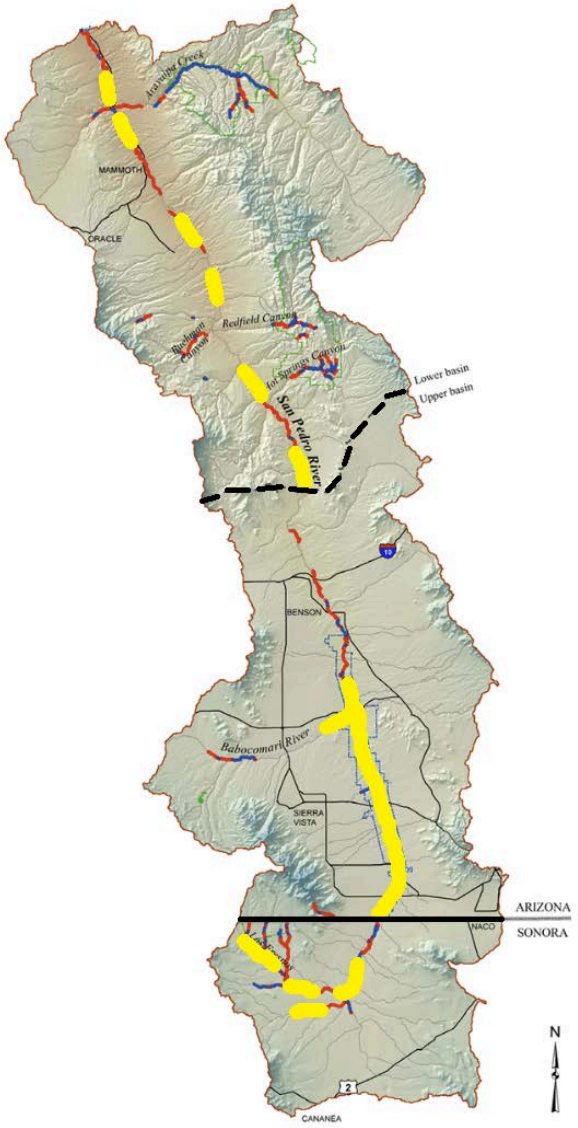

Figure 1: Map of reaches that were surveyed in the Fall 2024 San Pedro Beaver Survey highlighted in yellow. Base map credit: The Nature Conservancy

Protocol For Estimating Beaver Populations

Based on the proximity of each beaver sign, we were able to estimate where and differentiate between family groups and individual roaming beavers along the reaches of the San Pedro River in Arizona and Sonora.

Family groups were identified by clusters of activity that include one or more of the following: an active dam with recent repairs or nearby fresh chews, an active lodge with recent herbivory, tracks, or scat, extensive herbivory across multiple banks, downed and possibly moved trees,

food caches, or bank slides. These clusters suggest residency and typically represent a family group of about four beavers, with each family spaced at least ½ mile apart.

In contrast, roaming individuals are identified by smaller clusters of activity—usually a few fresh chews—without a dam or lodge within a ½ to 1-mile radius.

Population estimates are based on protocols informed by BLM research, literature reviews, and field observations. While the BLM generally uses a 1-mile spacing standard, WMG adopts a minimum ½-mile separation based on additional data sources (Campbell-Palmer et al. 2021).

These protocols were also peer reviewed by Dr. Steve Merkley, Biology instructor at Cochise College and Mike Foster, Local Naturalist & Videographer and interpretive staff for the Friends of the Huachuca Mountains at the Carr House Information Center.

Results

Based on survey responses along the reaches that were surveyed, we estimate that between 30-38 beavers are present on the San Pedro River and surveyed tributaries (see Table 1). Of the total, we estimate that there are approximately 13-17 beavers, including three family groups present in the reaches surveyed in Sonora. Within Arizona, we estimated 17-21 beavers, including 3-4 families. The SPRNCA had an estimated 9 beavers, including one family, while the middle and lower San Pedro had 8-12 beavers with 2-3 family groups.

In Sonora, of the eight reaches surveyed, three reaches (La Calera 1, 2, and 3) showed recent signs of beaver activity (see Figure 2). La Calera 1 had one individual beaver, and no families present. La Calera 2 had two families, with an estimated eight individual beavers. La Calera 3 had one family with approximately four beavers in that family. In total, these results give an estimate of 13 beavers in the San Pedro River headwaters in Sonora based on observed data. However, because the Cieneguitas area, where in prior years we had observed beaver activity, was not surveyed this Fall, we present the Sonora total as a range of 13-17 beavers to account for the possible presence of an additional family group.

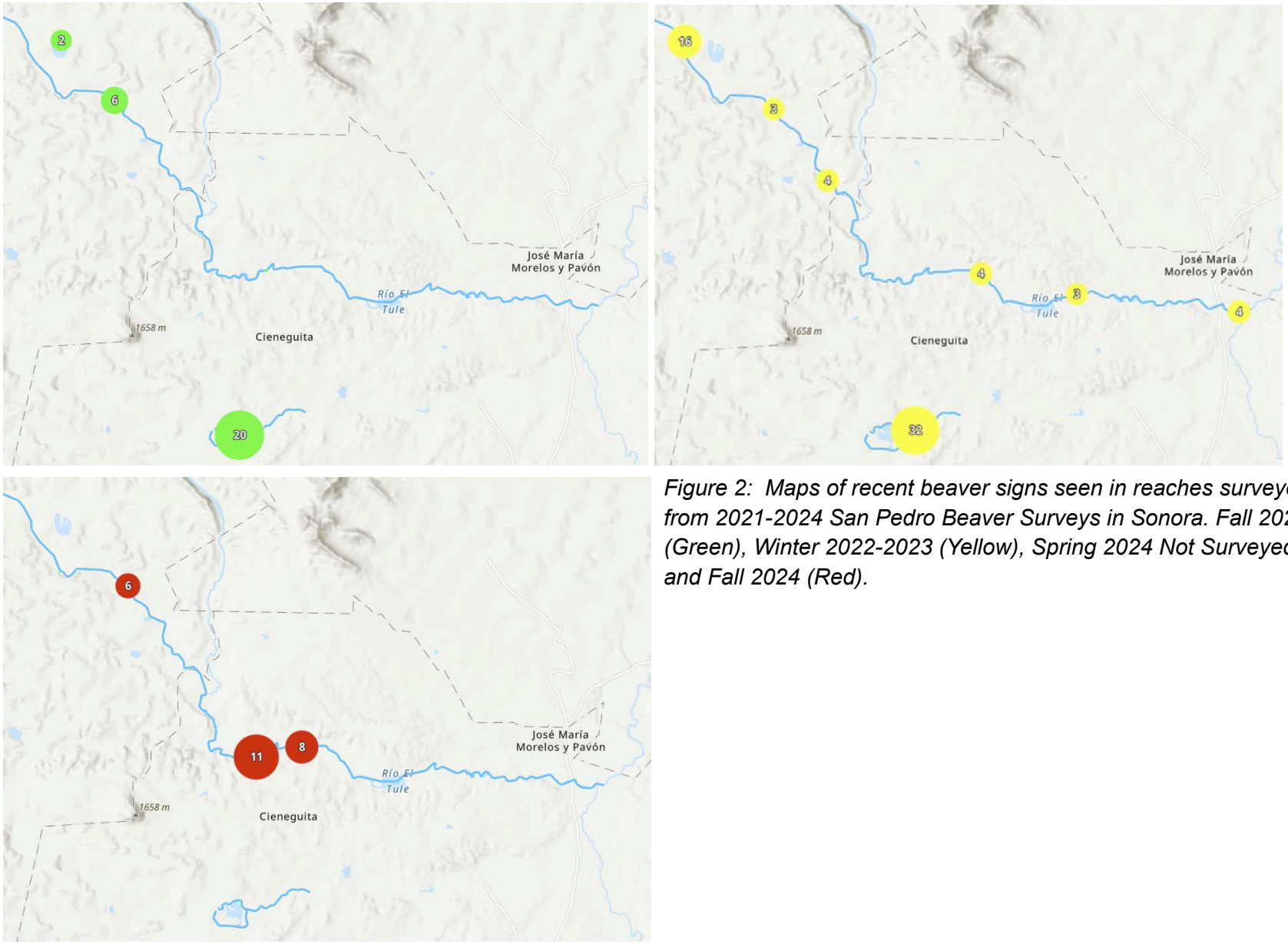

Figure 2: Maps of recent beaver signs seen in reaches surveyed from 2021-2024 San Pedro Beaver Surveys in Sonora. Fall 2021 (Green), Winter 2022-2023 (Yellow), Spring 2024 Not Surveyed, and Fall 2024 (Red).

In Arizona, surveys were conducted in the SPRNCA as well as the middle and lower San Pedro. In the SPRNCA (see Figure 3), of the 14 reaches that were surveyed, five of the reaches (Reach 3, 4, 5, 8, and 14) showed recent signs of beaver activity. Reach 3 had one roaming individual beaver; Reach 4 had 1 family with an estimated four individuals in the family; Reach 5 had one individual roaming beaver; Reach 8 had two roaming beavers along that stretch; Reach 14 along the lower Babocomari River had one roaming beaver. Overall, there were an estimated nine beavers, including one family in the SPRNCA. In the middle and lower San Pedro (see Figure 4), of the seven reaches surveyed, one reach (Reach 4: San Miguel) showed recent beaver activity. This reach had an estimated 2-3 families, with 8-12 individuals overall. Although we can confidently estimate 2 families based on survey results, an additional family was estimated based on communication with an AZGFD staff member.

Overall, the results of this year's survey present a continued decline in the beaver population along the San Pedro River is a concerning trend.

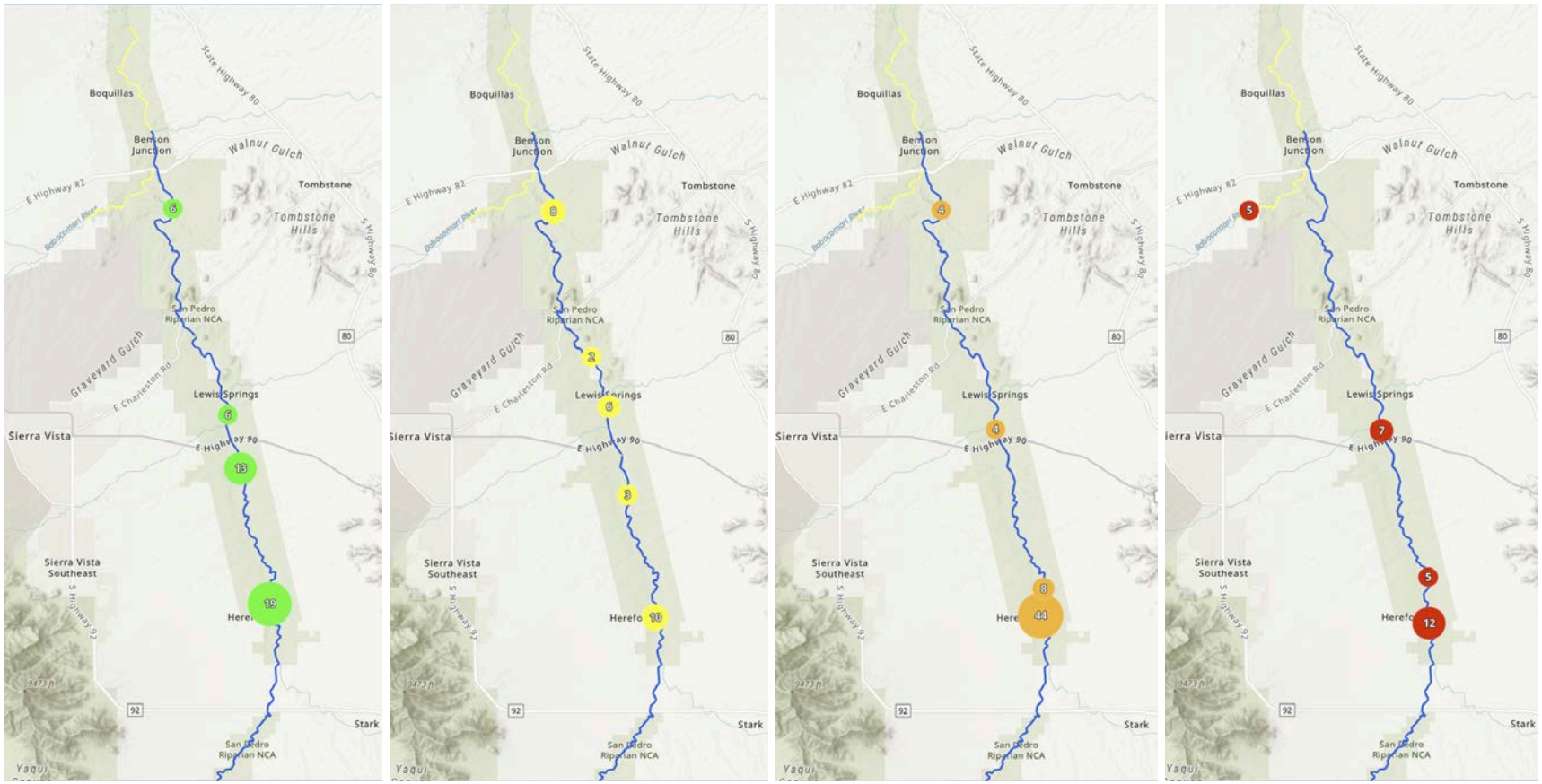

Figure 3: Maps of recent beaver signs seen in reaches surveyed from 2021-2024 San Pedro Beaver Surveys in SPRNCA. Fall 2021 (Green), Winter 2022-2023 (Yellow), Spring 2024 (Orange), and Fall 2024 (Red).

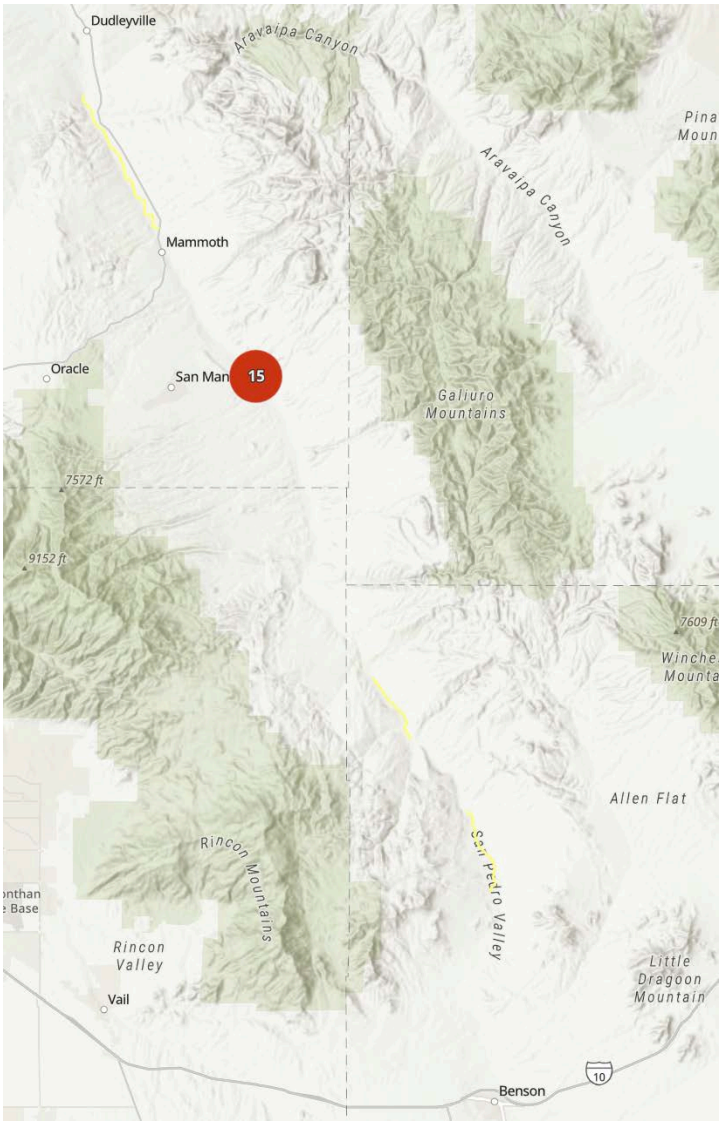

Figure 4: Map of recent beaver signs seen in reaches surveyed in Fall 2024 (red) along the middle and lower San Pedro River.

Estimate of San Pedro Beaver Population by Survey Year				
Location	**Survey Year**			
	Fall 2024*	**Spring 2024***	**Winter 2022-23**	**Fall 2021**
San Pedro Headwaters, Sonora, MX	13-17	-	24-26	20-32
Upper San Pedro, AZ, US	9	11-14	13-17	16-20
Lower San Pedro, AZ, US	8-12	-	-	-
Total	30-38	11-14	37-43	36-52

Table 1: San Pedro Beaver population estimate by year and section of the river.

*Note: Different water years for Fall 2024 and Spring 2024

Discussion

The southern Arizona beaver population has been in decline since peaking at over 100 beavers around 2010. This continued trend is troublesome. Partners have proposed potential reasons including fluctuating low/high flow monsoon seasons in recent years, seasonal and annual drought conditions, and increased predation by local species such as mountain lions, but these have not been investigated in detail. Further research is needed into other potential factors for the beaver population decline.

The main clusters of beaver activity are around the same location year-to-year, suggesting limited distribution of the beaver population, except along Reach 12 of the SPRNCA (see Figure 3). This reach had shown recent beaver presence in the past three surveys. However, the absence of recent activity in Fall 2024, combined with a lack of presence in adjacent reaches, suggests a trend in continued population decline, distribution elsewhere, or that surveyors did not detect recent beaver signs. Additionally, the range of clusters has reduced and tightened as the overall population estimate has decreased. Roaming beaver activity outside of these core areas is now minimal. Most observed activity remains in the same general locations documented in 2020 and 2021, with the exception of Reach 12.

In communication with AZGFD, in March 2024, recent beaver activity has been seen in the middle and lower San Pedro River north of the Aravaipa confluence, which has not had previous beaver activity. The upcoming Fall 2025 survey will determine if this site will still be active.

There were several clusters of beaver activity (herbivory, slides, etc.) near which no lodge or dam were found. Based on the surveys, it appears some beavers may be taking advantage of natural log jams and not building their own dams or lodges, or there may be beavers recently separated from their family unit to establish their own family.

Data suggests that beavers most often chewed willow trees in Spring and Fall 2024 surveys but preferred cottonwood trees in Fall 2022. One initially theorized possibility was that this was simply due to a difference in the survey question between years. The Spring and Fall 2024 surveys had volunteers enter the number of each type of tree chewed, while the 2022 survey only had them check a box for each type of tree chewed. However, even accounting for this and summing the 2024 tree data similarly to 2022, willow was still the most common type of tree to have fresh chews in Spring and Fall 2024. This difference in noted herbivory may be of interest for further investigation.

The presence of cattle is a major impediment to riparian habitat because cattle can disturb beaver habitat by trampling and browsing on young vegetation and degrading river banks and water quality. Fencing exclosures are legally required by BLM to protect the riparian habitat of the SPRNCA. However, there are gaps in the fencing as evidenced by results of the 2024 survey. Additional fencing and increased maintenance and monitoring is needed to keep cattle out of the SPRNCA riparian areas to protect beaver habitat. WMG shared cattle-related results of the survey with BLM so that it can better understand where cattle are present and work with landowners and ranchers to prevent cattle river access in the future. WMG is also partnering with landowners and ranchers on this topic including fence line upgrades on the Babocomari River (a tributary of the San Pedro River).

WMG will continue to advocate for beaver conservation in southern Arizona and northern Mexico and use the results of this year's survey to highlight that need. Recent and ongoing habitat restoration efforts in the lower San Pedro River and lower Babocomari River provide notes of progress in enhancing habitat along specific reaches and supporting a beaver response in both locations. Conversations with land managers and partner organizations along other sections of the river and watershed offer hope for future habitat enhancements to stabilize and help recover the beaver population.

Acknowledgements

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References

Johnson, G. and Van Riper, C. (2014). Effects of Reintroduced Beaver (*Castor canadensis*) on Riparian Bird Community Structure along the Upper San Pedro River, Southeastern Arizona and Northern Sonora, Mexico. U.S. Geological Survey.

Campbell‐Palmer, Puttock, A., Wilson, K. A., Leow‐Dyke, A., Graham, H. A., Gaywood, M. J., & Brazier, R. E. (2021). Using field sign surveys to estimate spatial distribution and territory dynamics following reintroduction of the Eurasian beaver to British river catchments. *River Research and Applications*, *37*(3), 343–357. https://doi.org/10.1002/rra.3755

Busher. (1987). Population Parameters and Family Composition of Beaver in California. *Journal of Mammalogy*, *68*(4), 860–864. https://doi.org/10.2307/1381567