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

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Watershed Management Group

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Executive Summary

Beavers used to be 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 (AGFD) in partnership with Bureau of Land Management (BLM) reintroduced the species to the San Pedro River. Building off previous monitoring efforts, Watershed Management Group and partners carried out bi-national beaver surveys along the San Pedro River in 2021 and 2022. Using a community-science collaboration, WMG and partners collected evidence of beavers in the watershed, including dams, tracks, and beaver chews. In spring 2024, WMG conducted the third and most recent annual bi-national beaver survey on the San Pedro River. The data from the Arizona portion resulted in an estimated population in 2024 of approximately 11-14 beavers along the San Pedro River in the U.S. This is slightly down from the 2022 estimate of 13-17 beavers on the same stretch of river. As of the time of writing, the Sonora, Mexico portion of the survey has been postponed and may be attempted later in 2024.

Introduction

Historically, beavers played a key role in maintaining watershed health for the Santa Cruz and San Pedro Rivers and were once keystone species in these watersheds. However, they were extirpated from local ecosystems by over-trapping in the 1800s. Beavers were reintroduced to the San Pedro Riparian National Conservation Area (SPRNCA) in 1999 and 2000. AGFD led the translocation/reintroduction of beavers and monitoring for a few years. Bureau of Land Management (BLM) continued monitoring for some years. The beaver population initially grew to over 100 by 2010, but has since sharply declined. The loss of this “ecosystem engineer” species is a threat to the health of these rivers especially in the current 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 a community-science driven survey in the SPRNCA area, based on Foster's experience with previous BLM surveys. In 2021, this effort was expanded and formalized under the leadership of WMG with the use of a beaver survey data collection application (Survey123), specific methodology and protocols, and partnerships to coordinate efforts between Arizona and Sonora, Mexico.

The goal of the bi-national survey is to better understand size and extent of beaver populations in the river and understand how the population changes and moves over time. Survey results provide valuable information for the management and restoration of beaver habitat in SPRNCA. Insights gained can be further applied to other areas in southern Arizona where beavers have been introduced or may be introduced in the future. The survey also gives WMG and partners information to help understand and forecast beaver reintroduction impacts on the local environment.

The Bi-National Beaver Survey is part of WMG's "Release the Beavers" campaign with goals 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 option to recharge groundwater aquifers and improve habitats for native wildlife species. Beavers are a keystone species whose natural behaviors can aid in restoring surface flows, slow floods, and improve 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

2024 Survey

Survey methods are based on community science models and are informed by a literature review of similar studies and consultation with local experts to determine which activities to record and how best to record those activities. The survey builds on the experience of partners who completed previous survey efforts, including Foster and Merkley, Naturalia, and previous BLM surveys.

The U.S. portion of the survey was conducted on March 2-3 along 38 miles of the San Pedro River within SPRNCA. The river stretch surveyed began at the U.S.-Mexico border and ended just north of Fairbank, Arizona. In Mexico, the survey was planned to be conducted on April 25-27 along 30 miles of a San Pedro River tributary up to the U.S.-Mexico border along with upstream and downstream of several ranch reservoirs on a separate tributary. The Mexico

survey was postponed for security reasons and may be completed later in 2024 once conditions allow.

Each day of the Arizona survey ran approximately from 9:00 AM to 4:00 PM. Over 75 WMG volunteers and staff hiked along the banks of the river recording evidence of beaver activity, including beaver tracks, tree chews, dams, and lodges. Volunteers were split into groups of 4-8 led by a WMG staff member, intern, or partner organization representative. Each group surveyed a 2-5 mile stretch of river. Group members took turns wading in the river (walking in water up to knee-level) and along both banks in order to spot beaver signs on both sides of the river. The ESRI ArcGIS Survey123 app was used to record observed beaver signs.

The Survey123 app uses the phone's GPS to record the location of each activity submission. Survey questions asked about beavers seen, active or abandoned dams (including dam size), active or abandoned burrows/lodges, recent or old chew marks, recent or old river slides, food caches, scat, and tracks. Each data point included information on nearby tree types (Willow, Cottonwood, Ash, Sycamore, Jarilla, and Hackberry), which trees had chew marks, and river flow level. Volunteers were required to submit a photo of each observation for verification and also had space to provide additional comments.

The beaver survey included recording cattle activity such as tracks, dung, or cattle seen. BLM policy excludes cattle from SPRNCA land to protect the riparian ecosystem, but they can often still enter SPRNCA because of damaged or missing fences. The presence of cattle is harmful to beaver habitat by trampling young vegetation and degrading river banks. To protect the beaver population, cattle observations were collected and submitted to BLM.

Protocols For Estimating Beaver Populations

Based on studies from BLM and other researchers, we assume there are four beavers per family group. We assume there is one family group per large cluster of activity, with family groups being spaced ½ mile to 1 mile apart (Campbell-Palmer et al, 2021). BLM used 1 mile during their dam surveys, however, based on literature research, conversations with partners, and WMG observations, we estimate separate families can be a minimum of ½ mile apart.

Activity indicating a family group has been active in the area within the last year includes:

- An active dam with recent repairs or fresh chews nearby,
- An active lodge (in the bank or channel) with recent herbivory, tracks, or scat nearby
- A substantial amount of recent herbivory that indicates beavers are staying in the area
    - Chews on many trees, potentially on different banks
    - Trees that have been downed and potentially moved
    - Food caches in the water
    - Bank slides showing repeat activity

Survey data showed small clusters of beaver activity that were recent and distant from larger cluster, but did not meet the criteria for a family group because they consisted of just a few fresh

chews with no dam or lodge nearby. Such clusters are attributed to one or two roaming beavers separate from family groups.

These protocols were peer reviewed by several individuals, who provided feedback:

- Steve Merkley, Cochise College
- Mike Foster, Local Naturalist, Friends of the Huachuca Mountains

Results

Survey results were used to estimate beaver population in the area based on peer-reviewed data protocols. WMG shares general areas of beaver activity, not specific locations, to help protect the beaver populations.

In 2024, survey volunteers recorded 174 beaver-related data entries in the U.S. Fresh beaver activity occurred in five clusters. Two clusters were considered large enough to meet the criteria for an active family group of four beavers. The other three were smaller, lacking active dams or lodges, and are thought to be caused by 1-2 roaming beavers independent of family groups. This results in an estimated population of 11-14 total beavers.

Table 1. 2024 Bi-National Beaver Survey Results with 2021-22 results for comparison

Data	2024 US Survey	2022 US Survey	2022 Mexico Survey	2022 Total	2021 US Survey	2021 Mexico Survey	2021 Total
Data Entries	174	171	120	291	62	31	93
Active Dams	0	1	9	10	2	12	14
Active Lodges	2	3	9	12	2	5	7
Food Caches	0	0	0	0	1	5	6
Recent Chews	51	26	56	82	41	12	53
Slides	9	12	2	14	23	10	33
Tracks	0	10	1	11	1	8	9
Scat	1	0	1	1	1	1	2
Scent Mounds	0	0	2	2	-	-	-
Interpretation							
Family Units*	2	2	6	8	4	5	9

Data	2024 US Survey	2022 US Survey	2022 Mexico Survey	2022 Total	2021 US Survey	2021 Mexico Survey	2021 Total
Roaming Beaver Groups	3	5	0	5	-	-	-
Estimated Population**	11-14	13-17	24-26	39-43	16-20	20-32	36-52
Change in Median Population Estimate	-17%	-17%	-4%	-7%	-	-	-
Most Abundant Trees Near Beaver Activity							
Willow	46	33	39	72	18	16	34
Cottonwood	96	136	71	207	40	13	53
Sycamore	1	0	0	0	0	1	1
Ash	1	1	7	8	0	1	1
Jarilla	7	-	-	-	-	-	-
Other	3	1	3	4	0	0	0
Tree Types with Beaver Chews* **							
	# of trees with fresh beaver chews by species	# of data entries indicating beaver chews on this species			# of data entries indicating beaver chews on this species		
Willow	125	28	42	70	28	11	39
Cottonwood	33	119	43	162	23	9	32
Sycamore	0	0	0	0	0	2	2
Ash	5	5	6	11	0	1	1
Jarilla	7	-	-	-	-	-	-
Other	0	6	17	23	1	0	1

*Family units are determined by either an active dam or lodge with families no closer than 0.5 mile from each other

**Population is based on 4 beaver family units in large activity clusters and 1-2 beavers for small clusters

***Survey question in 2024 was shifted to only reference for fresh chews and asked respondents to number chewed trees. This data is not directly comparable across years. See below for more information.

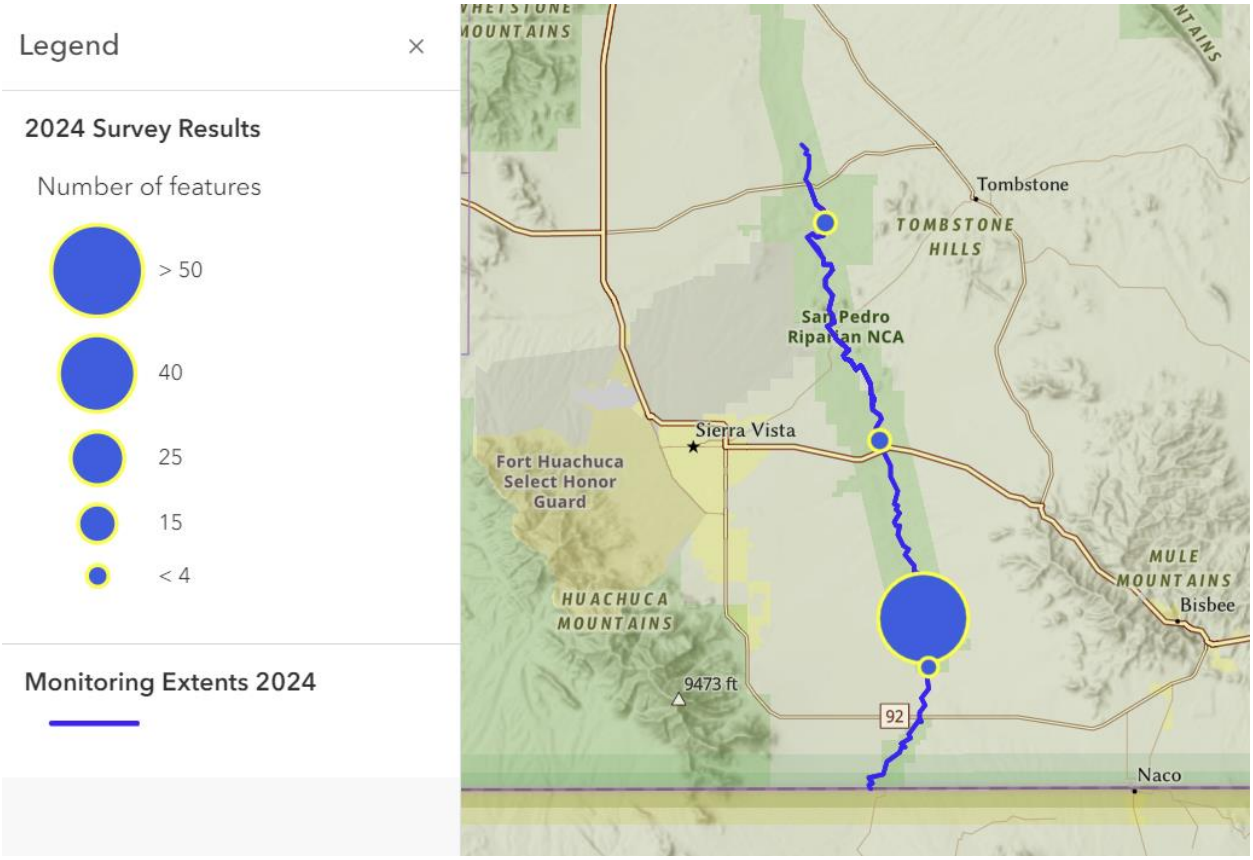

Figure 1. Map of 2024 beaver survey results and extents. Larger circles indicate more data entries of beaver evidence.

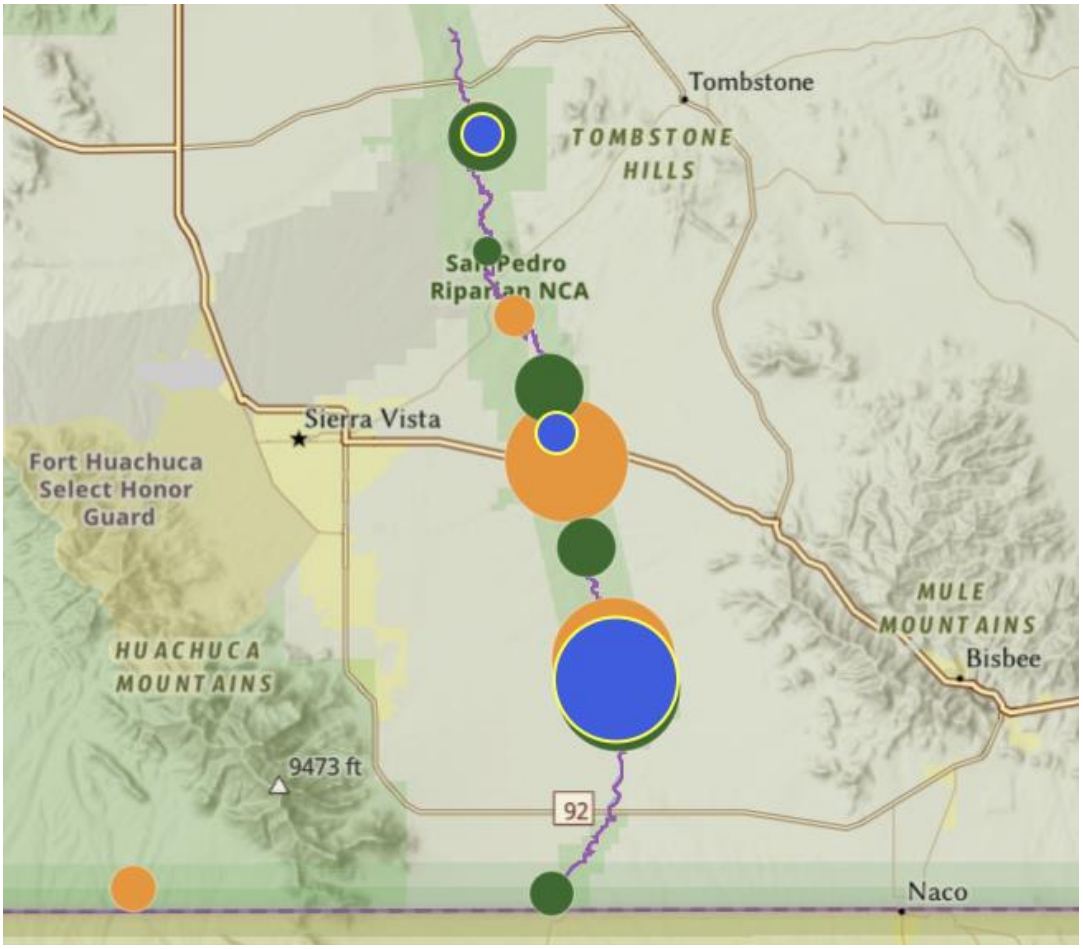

Figure 2. Comparison of Arizona survey results by year (blue = 2024, green = 2022, orange = 2021)

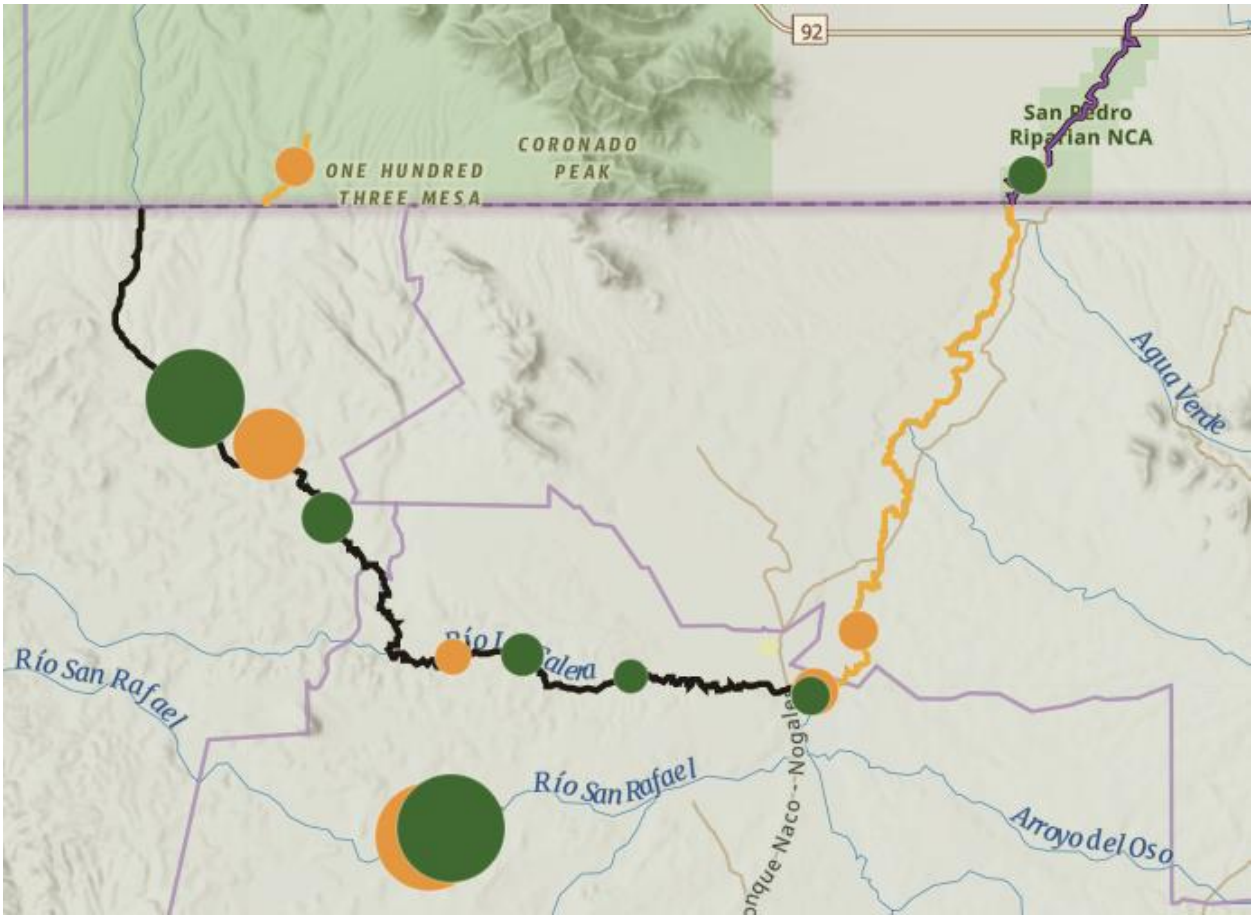

Figure 3. Comparison of Sonora, Mexico survey results and survey extents by year (blue = 2024 (*postponed*), green = 2022, orange = 2021, black line = surveyed in 2021 and 2022)

Discussion

Based on the observations, we estimate two beaver families and three roaming groups of 1-2 beavers in the upper San Pedro River in the U.S. This produces a population estimate of 11-14 beavers. The median value of this estimate has declined 17% from the 2022 survey, continuing a downward trend from 2021 to 2022.

Informal surveys from 2019 and 2020 resulted in an estimation of three family units in the U.S. These surveys exclusively used dams as the metric to estimate beaver population. Since WMG used additional signs of beaver activity to estimate beaver population, the 2022 and 2021 survey data cannot be directly compared to previous surveys. However, since only two family units are estimated for 2022, the data is indicating a declining beaver population along the San Pedro in Arizona.

The southern Arizona beaver population has been in decline from a population peak of over 100 beavers around 2010, so this continued trend is troublesome. Partners have proposed potential

reasons including fluctuating low/high flow monsoon seasons in recent years 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. WMG will continue to advocate for beaver conservation in southern Arizona and use the results of this year's survey to highlight that need.

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.

Additionally, the main clusters of beaver activity have not moved more than a couple of miles year-by-year, indicating limited movement of the beaver population. There is limited roaming beaver activity outside of these areas, but most of the observed activity is in the same general locations as in 2020 and 2021.

Data suggests that beavers most often chewed willow trees in spring 2024 but preferred cottonwood in fall 2022. One initially theorized possibility was that this was simply due to a difference in the survey question between years. The 2024 survey 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 2024. This discrepancy from 2022-24 warrants further investigation. It may be due to a seasonal or more long-term change in beaver behavior, but tree misidentification by volunteers is also a possibility.

The presence of cattle is a major impediment to beaver reintroduction because cattle can disturb beaver habitat by trampling young vegetation and degrading river banks. 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).

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References

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