Watershed Management Group
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Watershed Management Group 2022 Bi-National Beaver Survey of the San Pedro River: Survey Methods & Results

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Executive Summary

Beavers used to be a keystone species in the rivers of southeastern Arizona but were wiped out by trapping over 100 years ago. In an effort to revive the species locally and to regain the ecosystem services provided by beaver, the Bureau of Land Management reintroduced the species to the San Pedro River. Building off previous monitoring efforts, Watershed Management Group completed its first bi-national beaver survey along the San Pedro River in 2021. Using a community-science collaborative, WMG collected evidence of beavers in the watershed, including dams, tracks, and beaver chews. In winter 2022-2023, WMG continued this process by conducting the second annual bi-national beaver surveys to track the beaver populations in the region. The data resulted in an estimated population in 2022 of approximately 13-17 beavers along the San Pedro River in the U.S. and another 24-26 beavers along the San Pedro River in Mexico.

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. Removed from local ecosystems by over-trapping in the 1800s, they are returning to desert rivers. After beavers were reintroduced to the San Pedro Riparian National Conservation Area (SPRNCA) in 1999 and 2000, the beaver population made an initial comeback in the area. To restore beavers and their vital role of rehydrating our watersheds, we need a better understanding of current populations.

After reintroduction, the Bureau of Land Management (BLM) conducted annual surveys to monitor the beaver population in SPRNCA. When these ended in 2015, Mike Foster and Steve Merkley from Cochise College began informal surveys to monitor 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 the area. In 2021, this effort was expanded and

formalized under the leadership of WMG with the creation of a beaver survey app, specific methodology and protocols, and partnerships to coordinate efforts in the U.S. and Sonora, Mexico.

The goal of the bi-national survey is to better understand size and extent of the beaver population in the river and understand how the population changes or moves over time. The survey results provide valuable information for the management and restoration decision-making of beavers in SPRNCA and 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 impact 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. As a keystone species that - through natural behaviors - restores surface flows, slows flood flows, and improves ponding, beavers benefit the habitats of a number of other native species, including fish and bird species that support Arizona's recreation economy. Through education, community science, and advocacy, we can bring beavers back and restore southern Arizona's creeks and rivers.

Methods

2022 Survey
In 2022, the U.S. field survey was conducted along approximately 40 miles of the San Pedro River within SPRNCA, from the U.S.-Mexico border to St. David, Arizona. Additionally, several miles of the lower Babocomari River were surveyed in Arizona. The 2022 U.S. surveys occurred on November 19 and February 4 from approximately 9:00 AM to 4:00 PM. The second survey date was originally scheduled for December 3 but had to be postponed due to weather. Over 75 WMG staff members and volunteers hiked along the banks of the river recording evidence of beaver activity, including beaver tracks, tree chews, dams, and lodges.

In Mexico, the survey was conducted along about 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 surveys occurred on February 23 and 24 with 18 staff members from WMG, PROFAUNA, Naturalia, CONANP, Borderlands Restoration Network, Sky Island Alliance, National Park Service, and community volunteers.

The survey took place within the river (walking in water up to knee-level) and along both banks of the river. Carried out by community science volunteers trained by WMG, the survey was completed by WMG staff, WMG interns, WMG River Run Network members, partner organization members, and other community members. Each survey group consisted of

approximately 4-8 volunteers, led by a WMG staff member, intern, or partner organization representative, and surveyed, on average, a three to five mile stretch of river.

During the survey, volunteers hiked along and in the San Pedro River or upstream tributary in search of beavers or beaver activity. Survey volunteers used ESRI's ArcGIS Survey123 app on their phones to record any beavers or activity seen. The app survey methods are based on a community science effort, utilizing a variety of academic research and government reports to determine which activities to record and how to best 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 app uses the phone's GPS to record the location of each activity submission. App 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. In addition to beaver activities, volunteers were also asked to submit information on the trees within the area and trees with chew marks (willow, cottonwood, ash, and sycamore) and current river characteristics (flow level). Finally, volunteers submitted photos and any additional comments.

Protocols For Estimating Beaver Populations[1] [2]

Based on studies from BLM and other researchers, we assume there are four beavers per family group. We also assume there is one family group per cluster of activity, with family groups being spaced ½ mile to 1 mile apart.[1] 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, indicating family groups may be closer than 1 mile apart.

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

- A beaver dam
    - Active if there are recent repairs or fresh chews
- An active beaver lodge (located either in the bank or channel)
    - Active if there are 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

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

- Steve Merkley, Cochise College
- John Windes, Shawn Lowery, and Angie Stingelin, Arizona Game and Fish Department

[1] Evidence based Eurasian beaver census. River Research Apps - 2020 - Campbell□Palmer - Using field sign surveys to estimate spatial distribution and territory.pdf

[2] Beaver family composition and density in California. Beaver census in California.pdf

- Gerardo Carreon and Carlos Valdez, Naturalia
- Hank Harlow, University of Wyoming

Results

Survey results were collected, reviewed, and 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. The 2022 survey resulted in 171 data entries in the U.S., with an estimated beaver population of 16-20 beavers within four family units, and 120 data entries in Mexico, with an estimated beaver population of 20-32 beavers. Results from the 2022 survey can be seen in Table 1. The locations of the surveyed beaver locations can be seen in Figure 1.

Table 1. 2022 Bi-National Beaver Survey Results

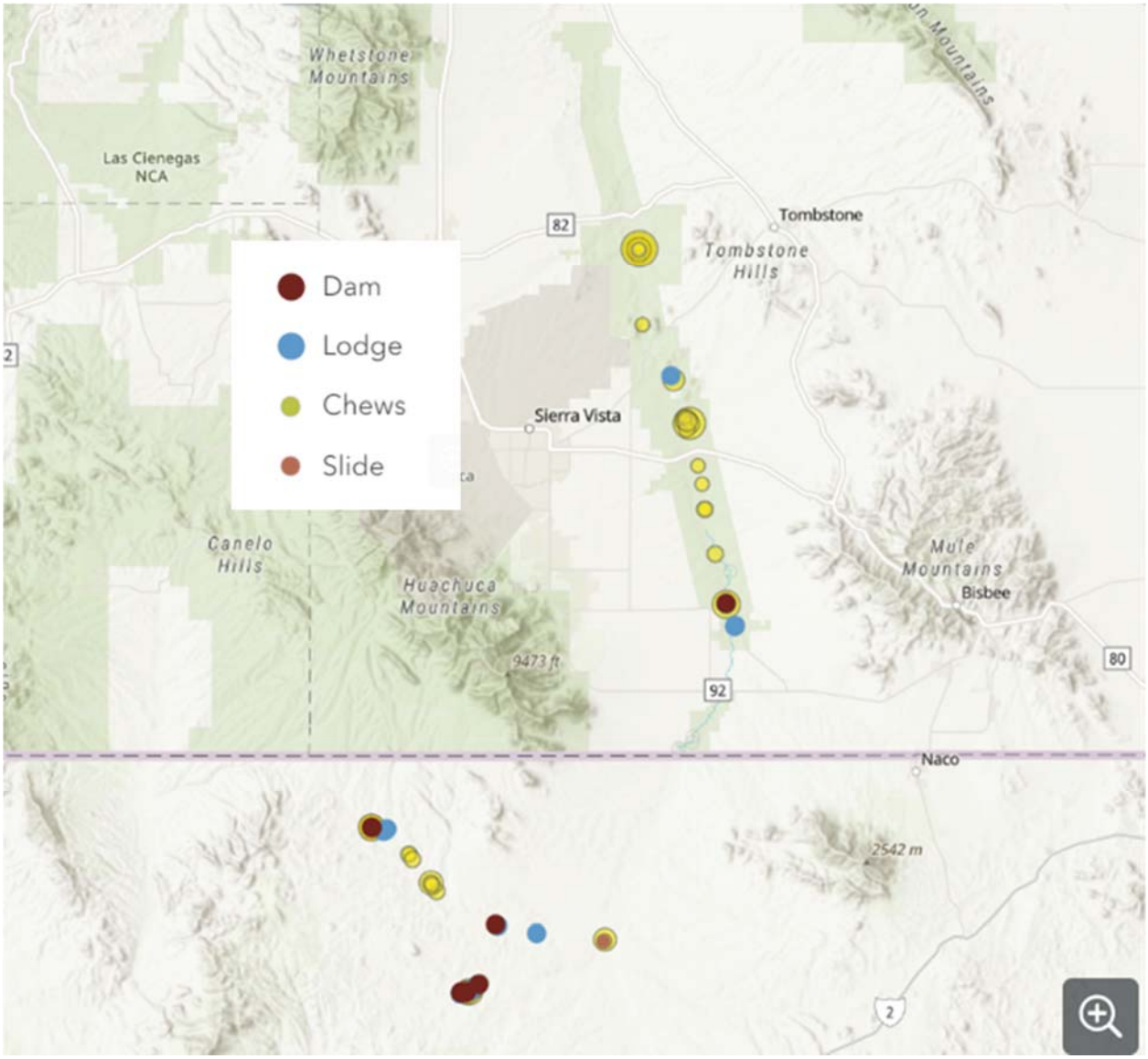
Data	2022 US Survey Entries	2022 Mexico Survey Entries	Total
Data Entries	171	120	291
Active Dams	1	9	10
Active Lodges	3	9	12
Food Caches	0	0	0
Recent Chews	26	56	82
Slides	12	2	14
Tracks	10	1	11
Scat	0	1	1
Scent Mounds	0	2	2
Interpretation			
Family Units*	2	6	8
Estimated Population**	13-17	24-26	39-43
Most Abundant Trees Near Beaver Activity			
Willow	33	39	72
Cottonwood	136	71	207

Data	2022 US Survey Entries	2022 Mexico Survey Entries	Total
Sycamore	0	0	0
Ash	1	7	8
Other	1	3	4
Trees with Beaver Chews			
Willow	28	42	70
Cottonwood	119	43	162
Sycamore	0	0	0
Ash	5	6	11
Other	6	17	23

*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 beavers per family unit

Figure 1. Locations of 2022 Bi-National Beaver Survey Survey Data Entries



Discussion

Using the beaver population estimation protocols, WMG was able to provide a rough estimate of the beaver families and population for the areas surveyed in the U.S. and Mexico. The estimates for the U.S. are believed to be more accurate because the protocols were designed with a stream system in mind, and that was the majority of the habitat along the U.S. survey locations. There are an estimated two beaver families in the upper San Pedro River in the U.S., resulting in a population of roughly 8 beavers. However, 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. With this in mind, WMG estimates 13-17 beavers for the stretches of river surveyed in the U.S.

In Mexico, the beavers are inhabiting the deep water provided by man-made reservoirs. Because of this, the estimation protocols lose some reliability. However, WMG will be refining the protocols as more is learned about this beaver population through future surveys and through collaboration with local Mexican nongovernmental organizations. WMG, PROFAUNA, and Naturalia estimate 6 family units based on active lodges. With that estimate and taking into account any “lodgeless” beavers, we estimate 24-26 individual beavers within the areas surveyed in Mexico.

Combining the U.S. and Mexico numbers, we approximate nine beaver families and 37-43 individuals within the surveyed area. The overall totals are consistent with the 2021 survey results, indicating that, while beaver populations are not growing along the San Pedro River, they are also not on the decline. However, there is a growing difference between the U.S. and Mexico population sizes, with a slight increase in the population in Mexico and a slight decline in the population in the U.S.

Additionally, the main clusters of beaver activity did not move more than a couple of miles in comparison to the data collected in 2021, indicating limited movement of the beaver population. There is limited “rogue” activity outside of these areas, but most of the observed activity is in the same general locations as in 2020 and 2021.

The 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 the U.S. 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. WMG will continue to advocate for additional beaver reintroductions in southern Arizona and use the results of this year's survey to highlight that need.

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 2022 survey, which included questions on cattle presence and activity including cow dung and tracks. 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, which resulted in surveying the lower three to four miles of the Babocomari River (a tributary of the San Pedro River) with local landowners this year.

Acknowledgements

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