Watershed Management Group 2021 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. Based on this community-science collaborative, WMG collected evidence of beavers in the watershed, including dams, tracks, and beaver chews. The data resulted in an estimated population in 2021 of 16-20 beavers along the San Pedro River in the U.S. and another 20-32 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

2021 Survey
In 2021, 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 Bear Creek tributary were surveyed in Arizona. The 2021 U.S. surveys occurred on November 20 and December 4 from approximately 9:00 AM to 4:00 PM. Over 40 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 the main stem of the San Pedro and tributaries up to the U.S.-Mexico border.

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, River Run Network members, partner organization members, and other community members. Each survey group consisted of approximately 4-7 volunteers, led by a WMG staff member or intern, and surveyed an approximately four mile stretch of river.

During the survey, volunteers hiked along and in the San Pedro River in search of beavers or beaver activity. Survey volunteers used the 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 tracked the exact 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, Arizona 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 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 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
- 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 2021 survey resulted in 62 data entries in the U.S., with an estimated beaver population of 16-20 beavers within four family units, and 31 data entries in Mexico, with an estimated beaver population of 20-32 beavers.

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[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

Results from the 2021 survey can be seen in Table 1. The locations of the surveyed beaver locations can be seen in Figure 1.

Table 1. 2021 Bi-National Beaver Survey Results

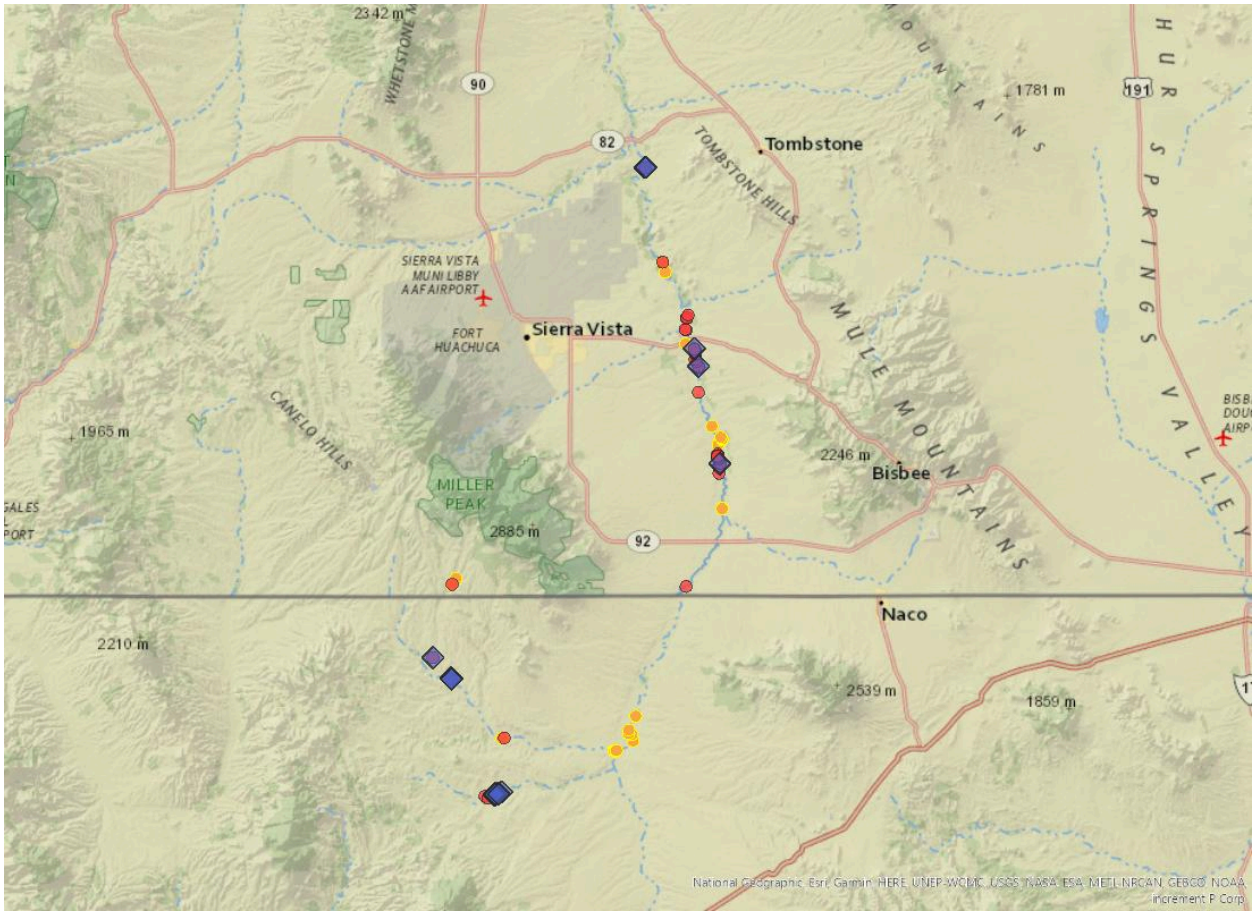
Data	2021 US Survey Entries	2021 Mexico Survey Entries	Total
Data Entries	62	31	93
Beavers Seen	2	2	4
Active Dams	2	12	14
Active Lodges	2	5	7
Food Caches	1	5	6
Recent Chews	41	12	53
Slides	23	10	33
Tracks	1	8	9
Scat	1	1	2
Interpretation			
Family Units*	4	5	9
Estimated Population**	16-20	20-32	36-52
Most Abundant Trees Near Beaver Activity			
Willow	18	16	34
Cottonwood	40	13	53
Sycamore	0	1	1
Ash	0	1	1
Other	0	0	0
Trees with Beaver Chews			
Willow	28	11	39

Cottonwood	23	9	32
Sycamore	0	2	2
Ash	0	1	1
Other	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 beavers per family unit

Figure 1. Locations of 2021 Bi-National Beaver Survey Survey Data



Map legend: Blue diamonds are active dams and lodges. Red dots are recent herbivory. Yellow dots are old beaver activity (greater than 1 year old).

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 four beaver families in the Lower San Pedro River and Bear Creek based on two active dams and two active lodges, each in 4 separate areas more than ½ mile apart from each other, resulting in a population of roughly 16 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 16 to 20 beavers for the stretches of river surveyed in the U.S.

In Mexico, the beavers are inhabiting the deep water provided by natural and 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 estimates five family units based on five active lodges. With that estimate and taking into account any “lodgeless” beavers, WMG estimates 20-32 individual beavers within the areas surveyed in Mexico. Combining the U.S. and Mexico numbers, WMG approximates nine beaver families and 36 to 52 individuals within the surveyed area.

The main clusters of beaver activity did not move more than a couple of miles in comparison to the data collected in 2020, 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.

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 2021 survey data cannot be directly compared to previous surveys. However, since four family units are estimated for 2021, WMG is confident that there is at least a stable beaver population along the San Pedro in the U.S. Future surveys will allow for direct comparison and statements on population growth.